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Cho et al.

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(54) **ELECTRONIC DEVICE INCLUDING ROLLER**

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CPC ***G06F 1/1652*** (2013.01); ***G06F 1/1601*** (2013.01); ***G06F 1/1681*** (2013.01)

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CPC G06F 1/1652; G06F 1/1601; G06F 1/1681; G06F 1/16; G06F 1/1624; G06F 1/1637; G06F 1/1662; G06F 1/1666; G06F 1/1628; G06F 1/1647
See application file for complete search history.

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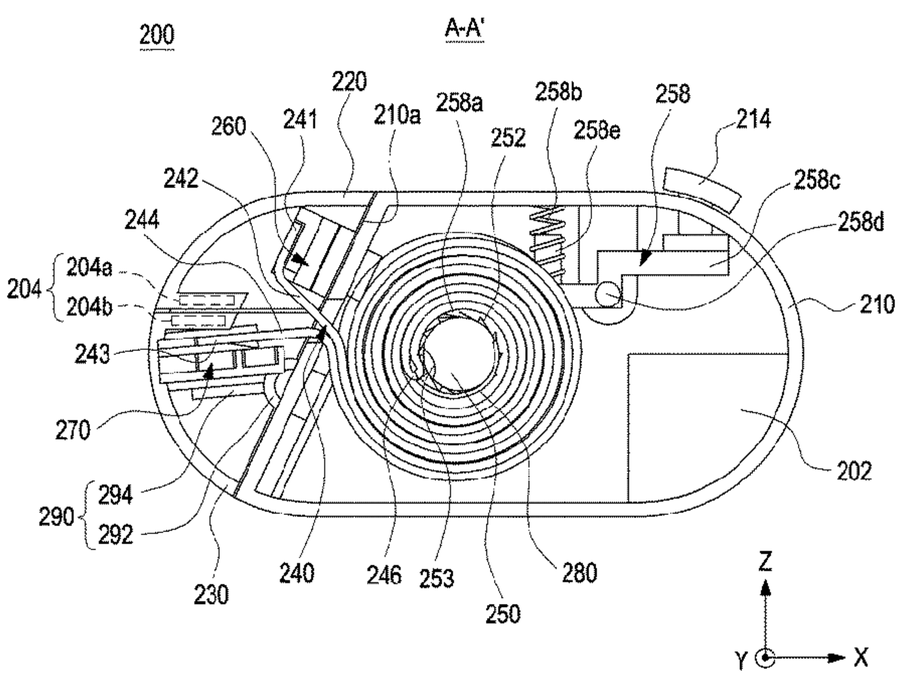
(57) **ABSTRACT**

According to certain embodiments of the disclosure, an electronic device may include: a housing, a roller disposed in the housing, a first cover part configured to be detachable from the housing, a second cover part configured to be detachable from the housing, and a display including a first display area including a first end coupled with the first cover part, and a second display area including a second end coupled with the second cover part, wherein at least a portion of the first display area is configured to be wound around the roller while facing at least a portion of the second display area.

15 Claims, 16 Drawing Sheets



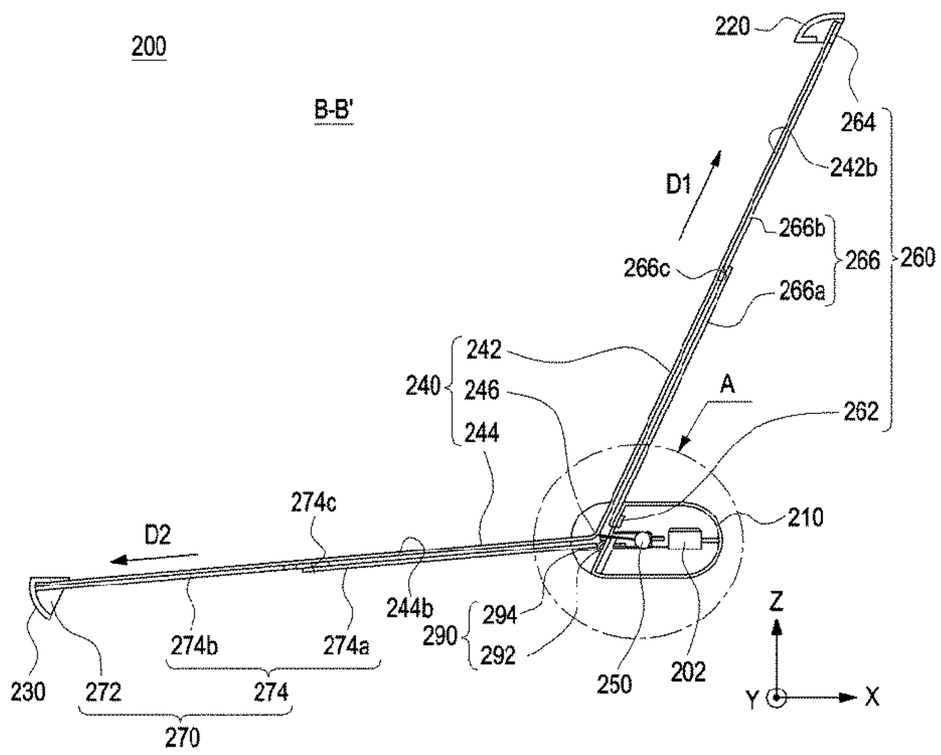


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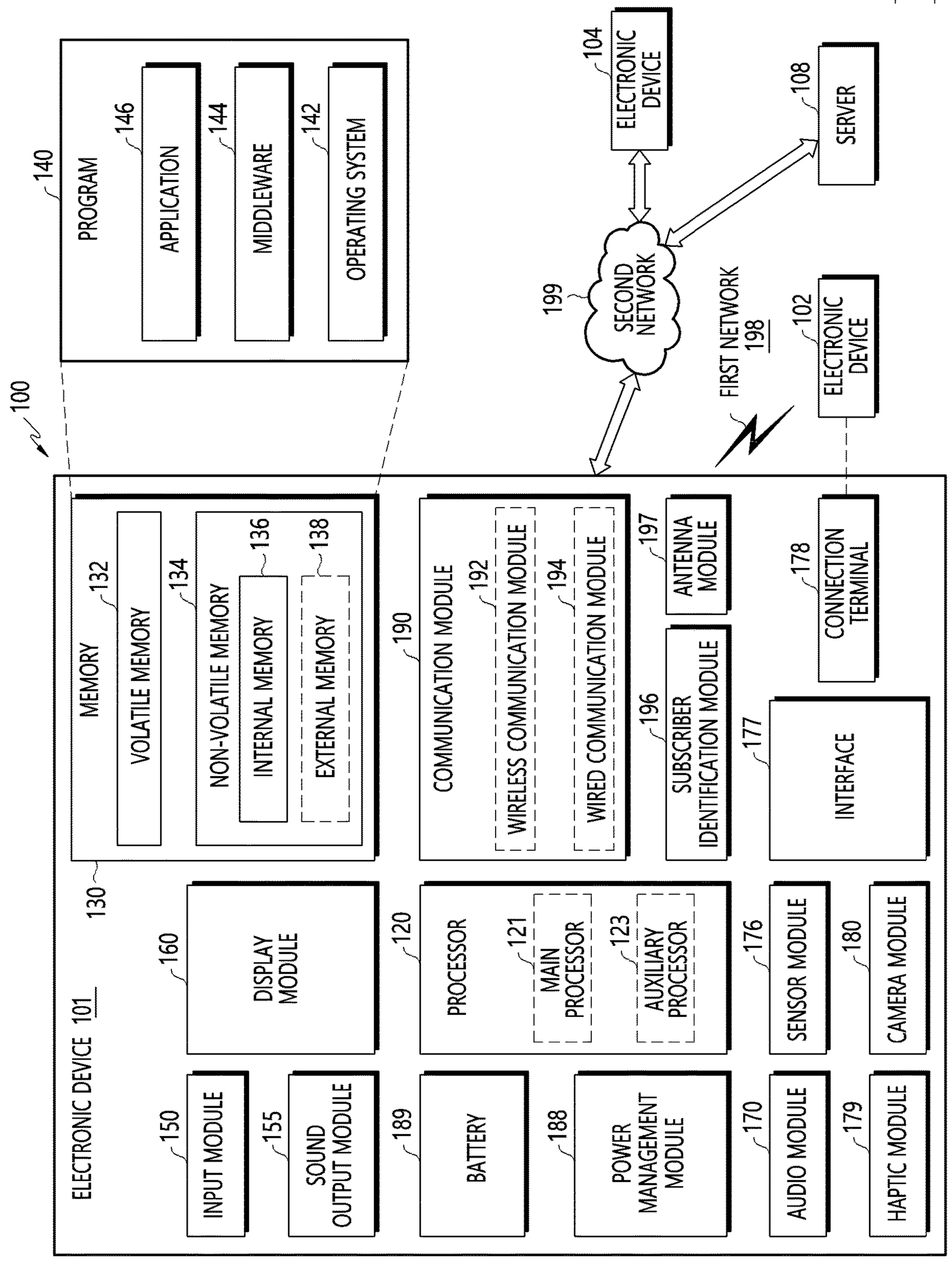
FIG.1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ELECTRONIC DEVICE 101
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PROGRAM
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APPLICATION
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MIDDLEWARE
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OPERATING SYSTEM
142
MEMORY
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VOLATILE MEMORY
134
NON-VOLATILE MEMORY
INTERNAL MEMORY
136
EXTERNAL MEMORY
138
COMMUNICATION MODULE
190
WIRELESS COMMUNICATION MODULE
192
WIRED COMMUNICATION MODULE
194
ANTENNA MODULE
197
SUBSCRIBER IDENTIFICATION MODULE
196
CONNECTION TERMINAL
178
INTERFACE
177
INPUT MODULE
150
SOUND OUTPUT MODULE
155
DISPLAY MODULE
160
BATTERY
189
POWER MANAGEMENT MODULE
188
PROCESSOR
120
MAIN PROCESSOR
121
AUXILIARY PROCESSOR
123
AUDIO MODULE
170
SENSOR MODULE
176
CAMERA MODULE
180
HAPTIC MODULE
179
104
ELECTRONIC DEVICE
108
SERVER
199
SECOND NETWORK
FIRST NETWORK
198
102
ELECTRONIC DEVICE

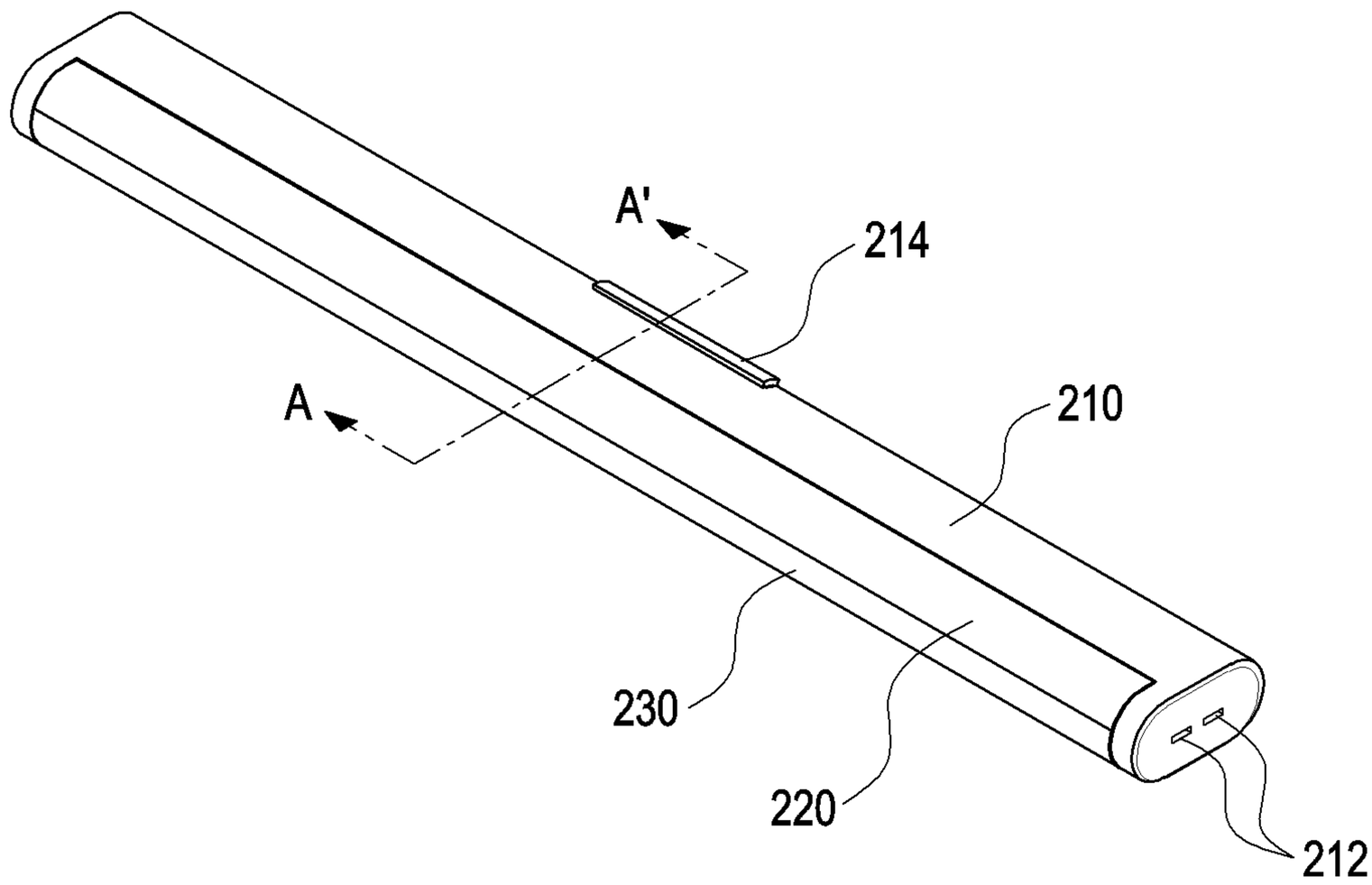


FIG.2

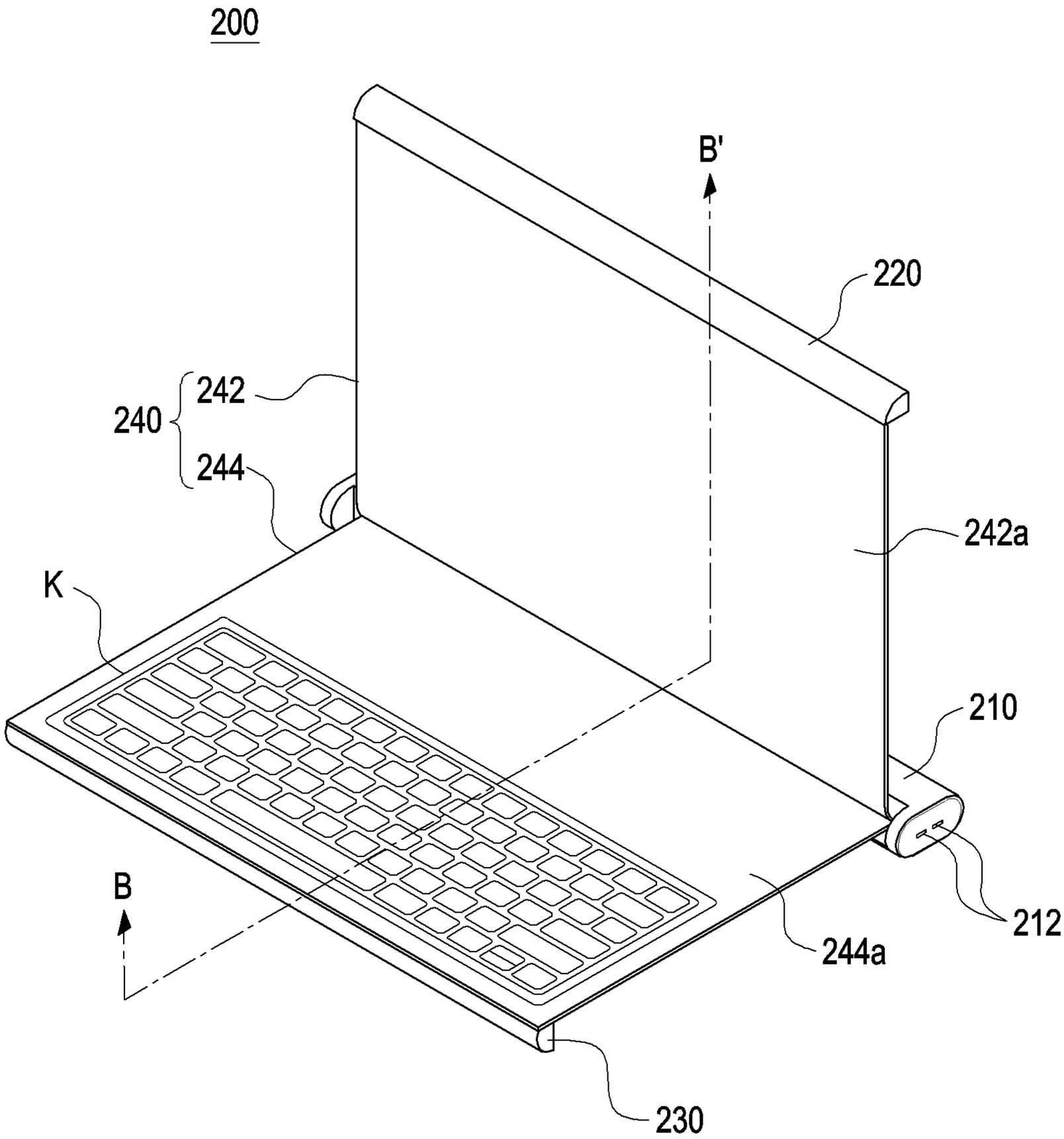
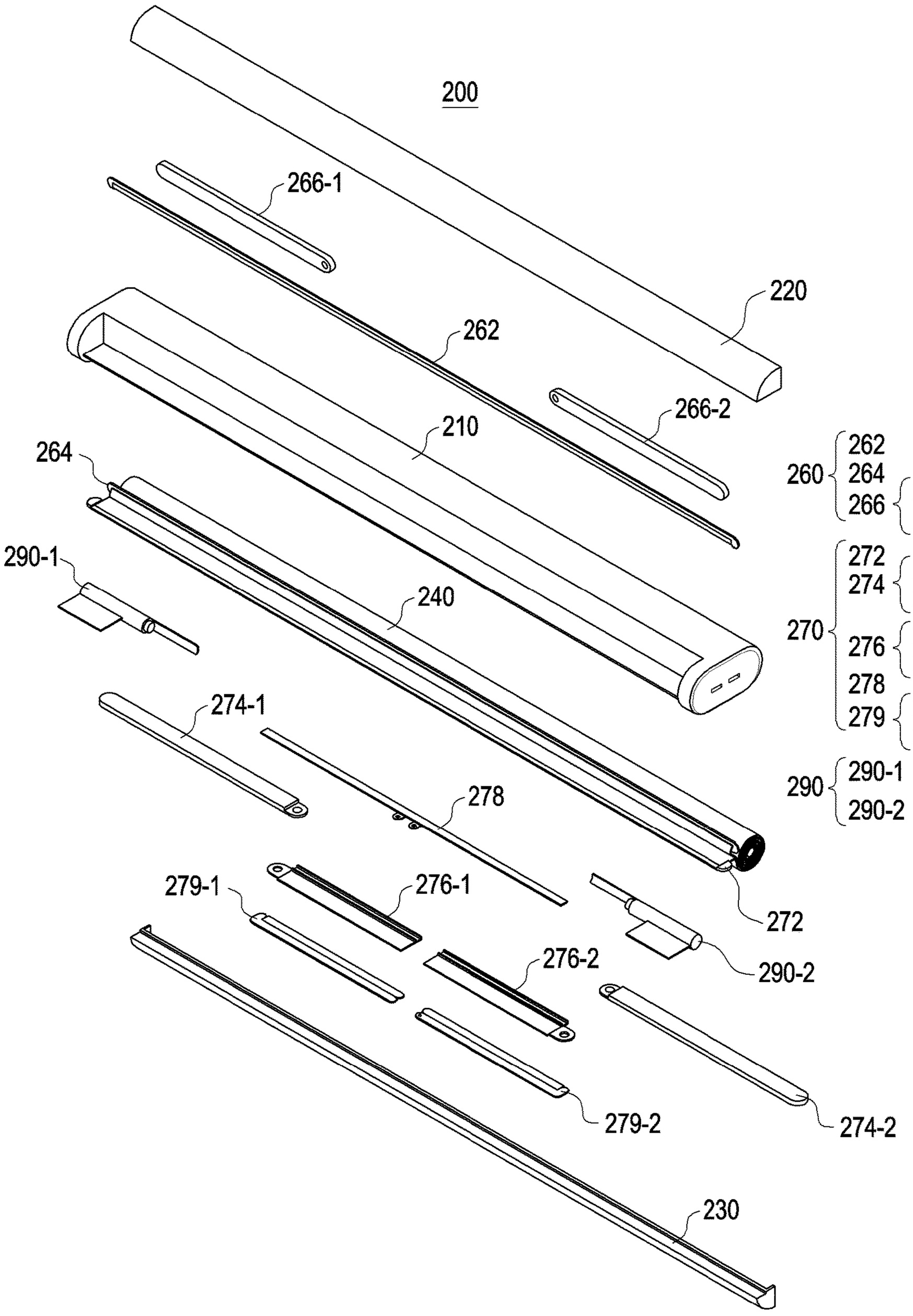


FIG.3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262
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266
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270
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FIG.4

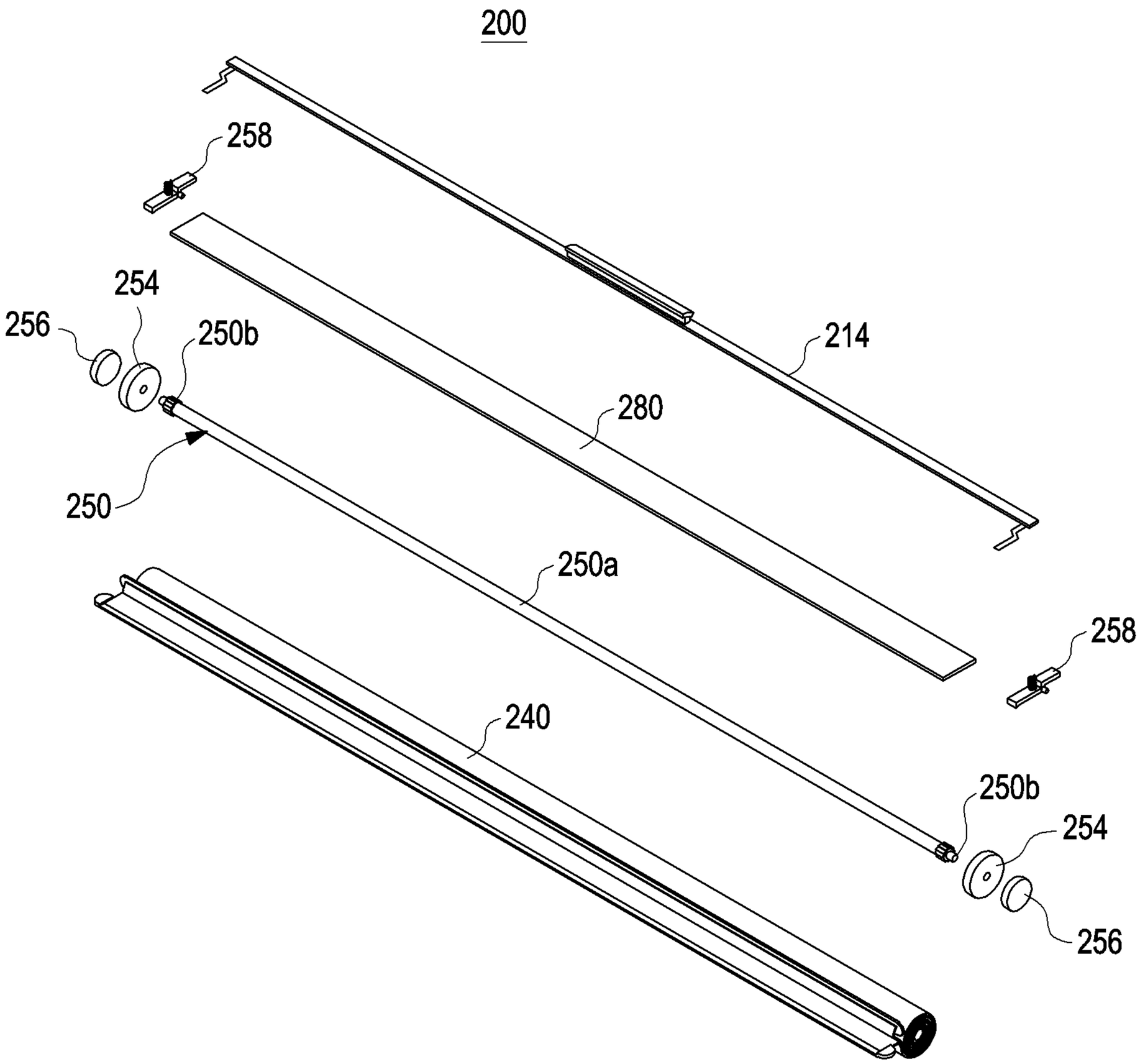
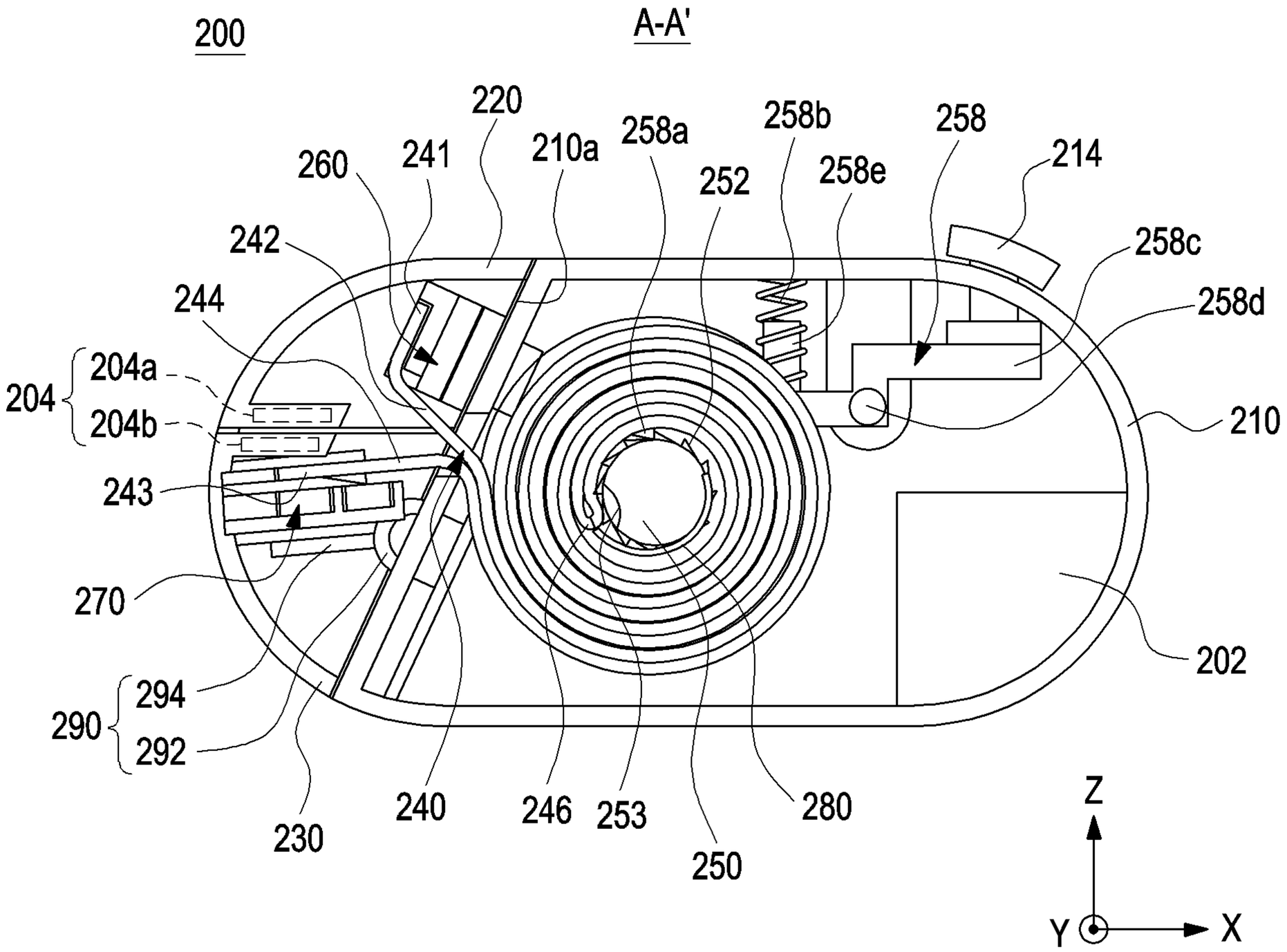


FIG.5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A-A'
220
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258a
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258b
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258
214
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258c
244
258d
204
204a
204b
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243
270
202
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294
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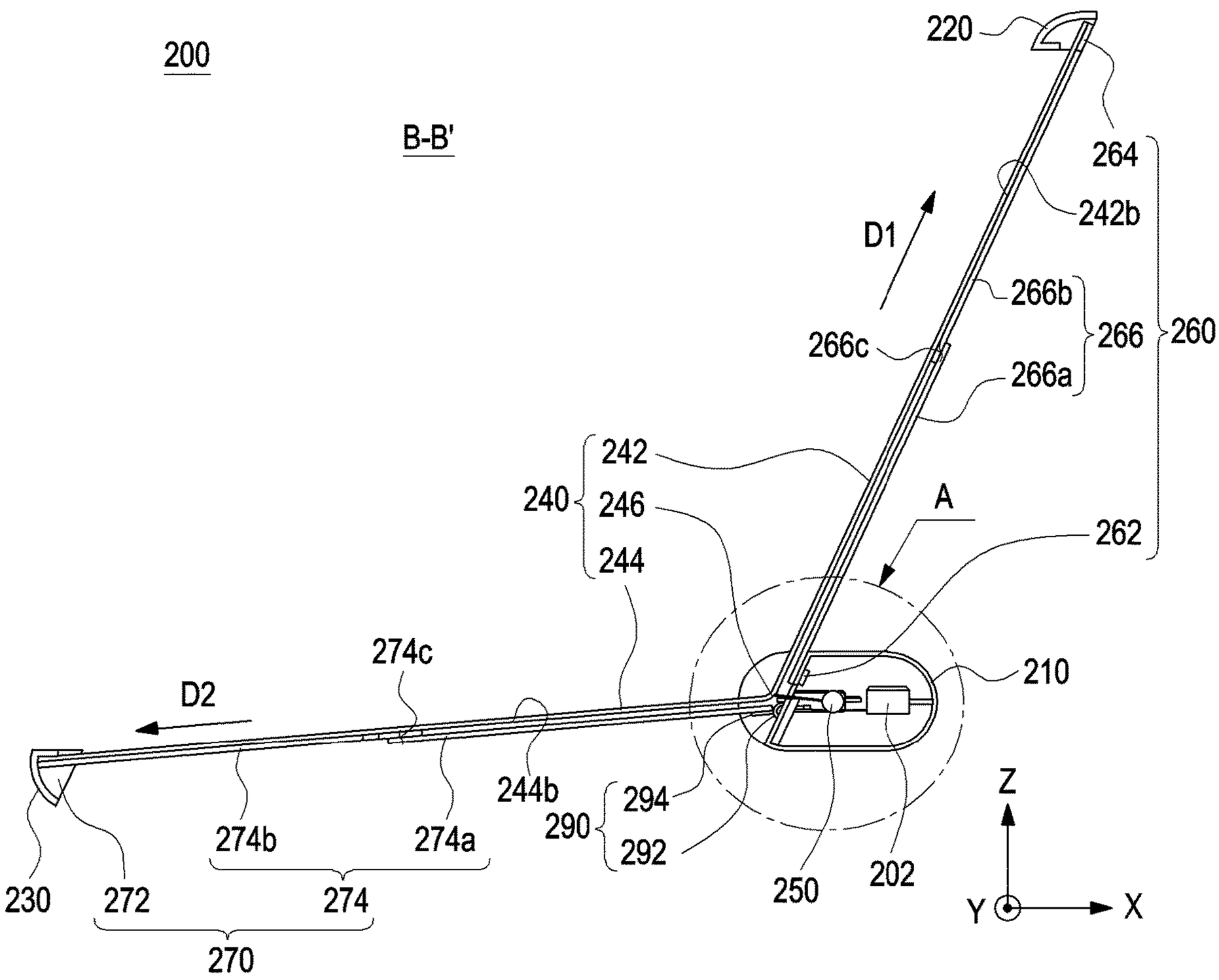
253
250
280
Z
Y
X

FIG.6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274c
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250
202
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Y
X
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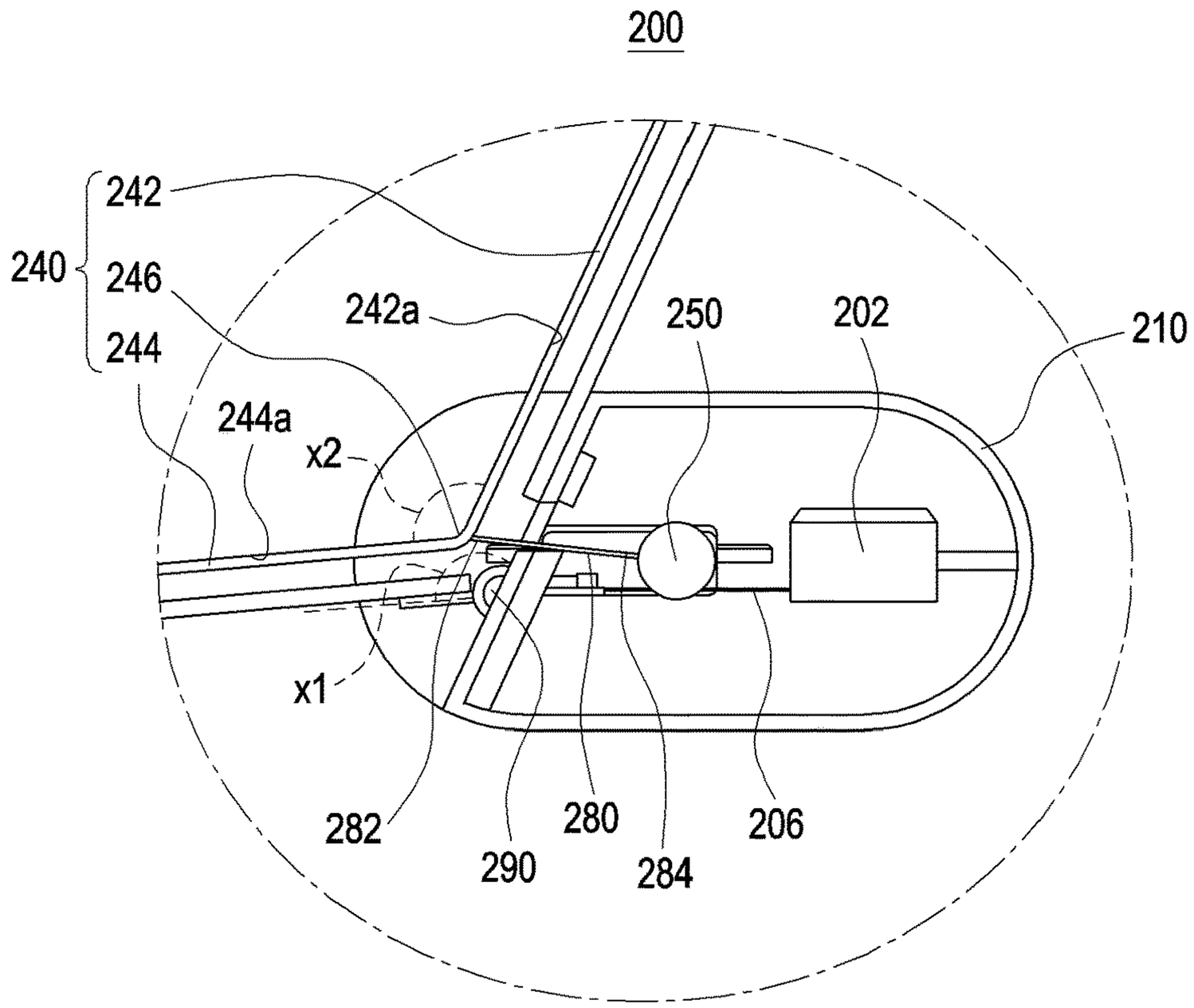
FIG.7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x2
x1
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284
206

FIG.8

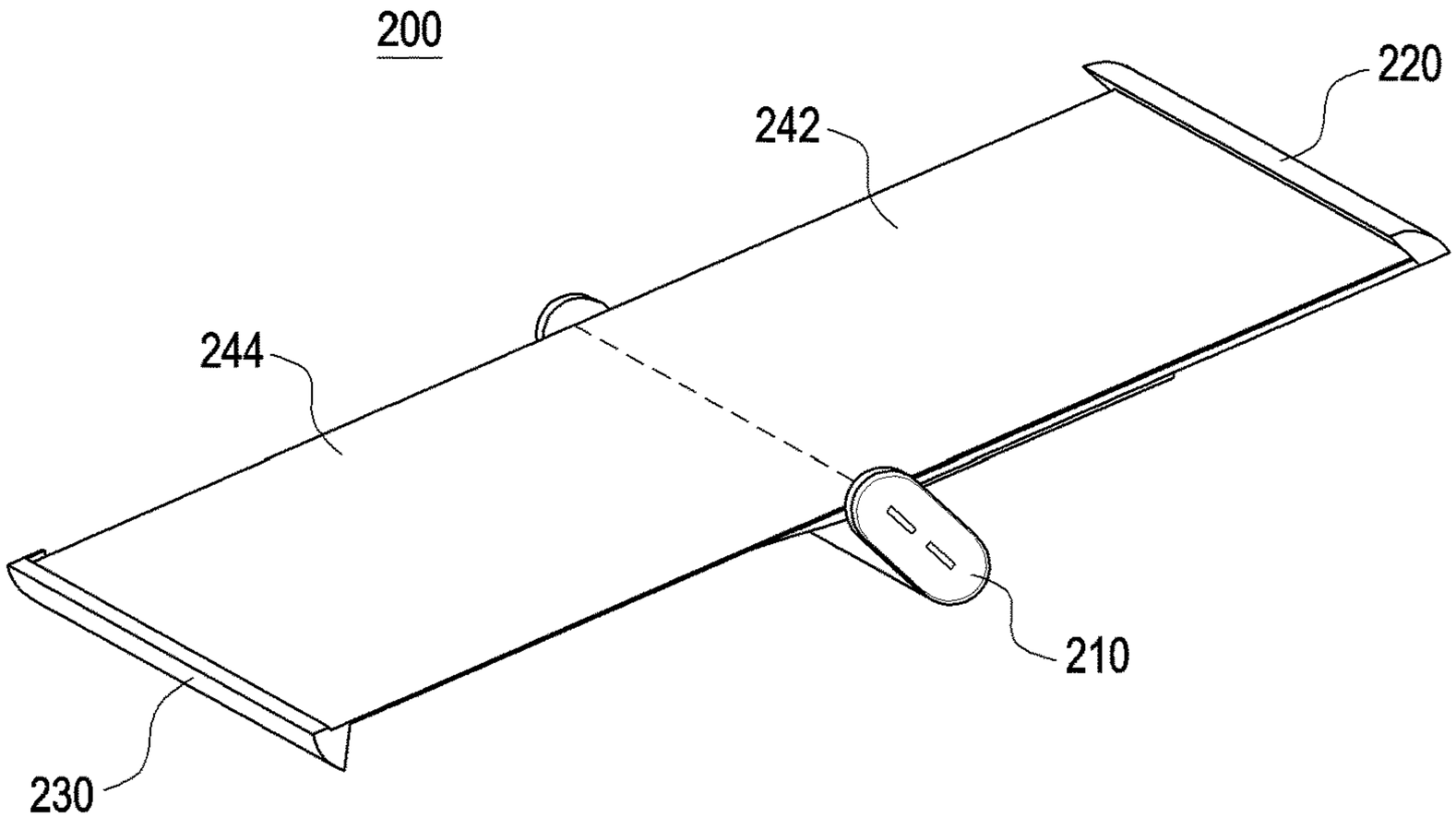
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FIG.9

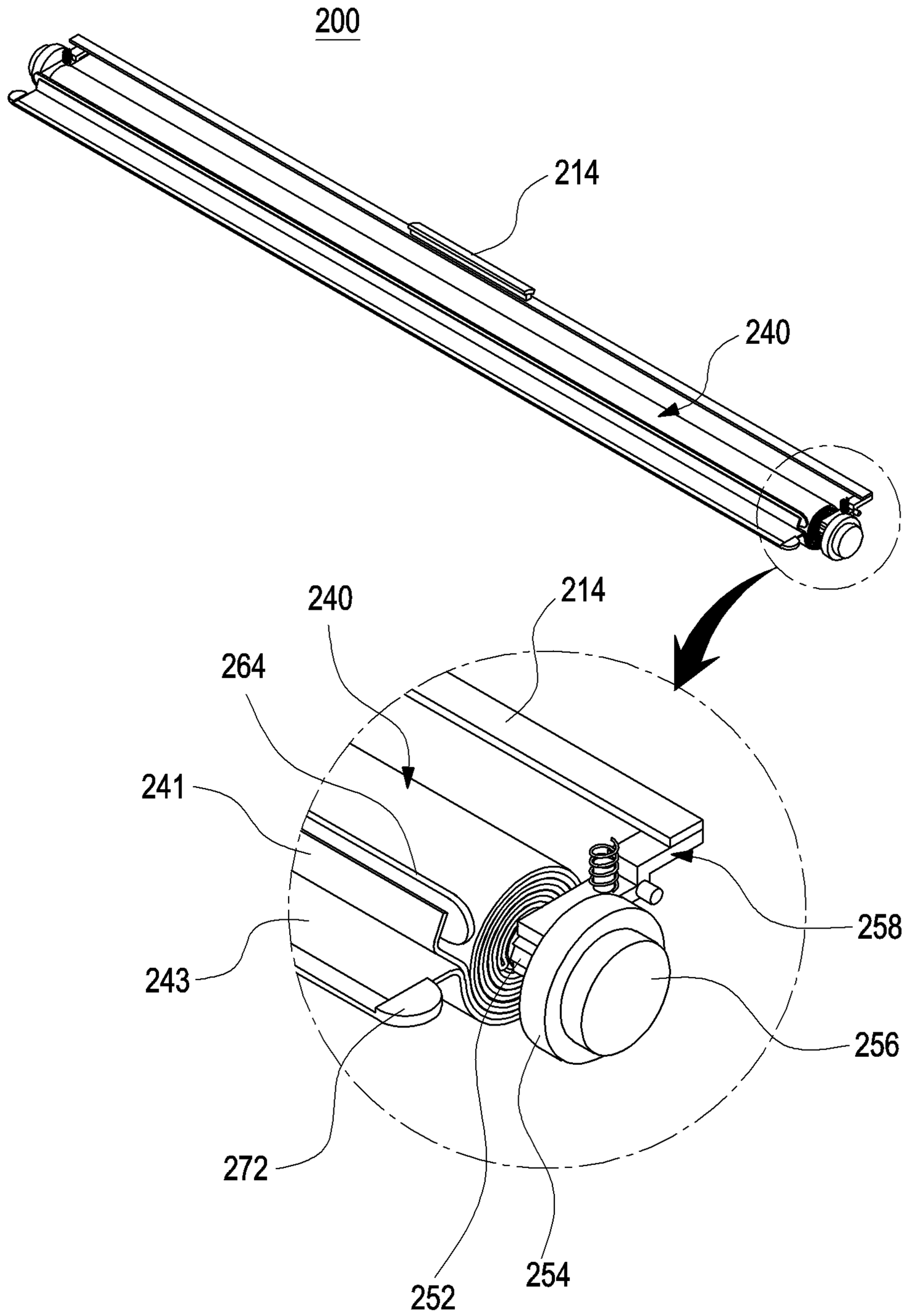

FIG.10

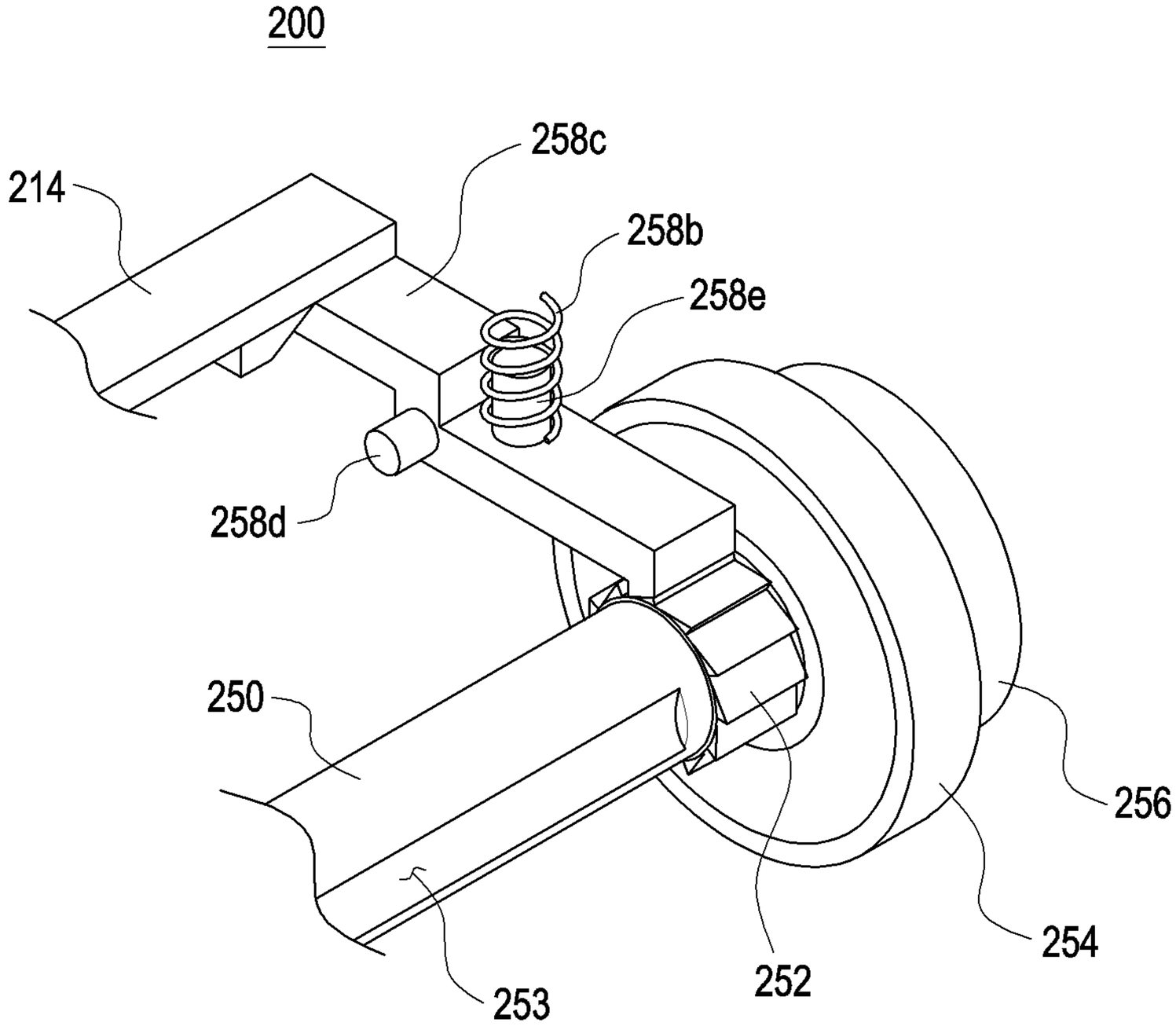

FIG.11

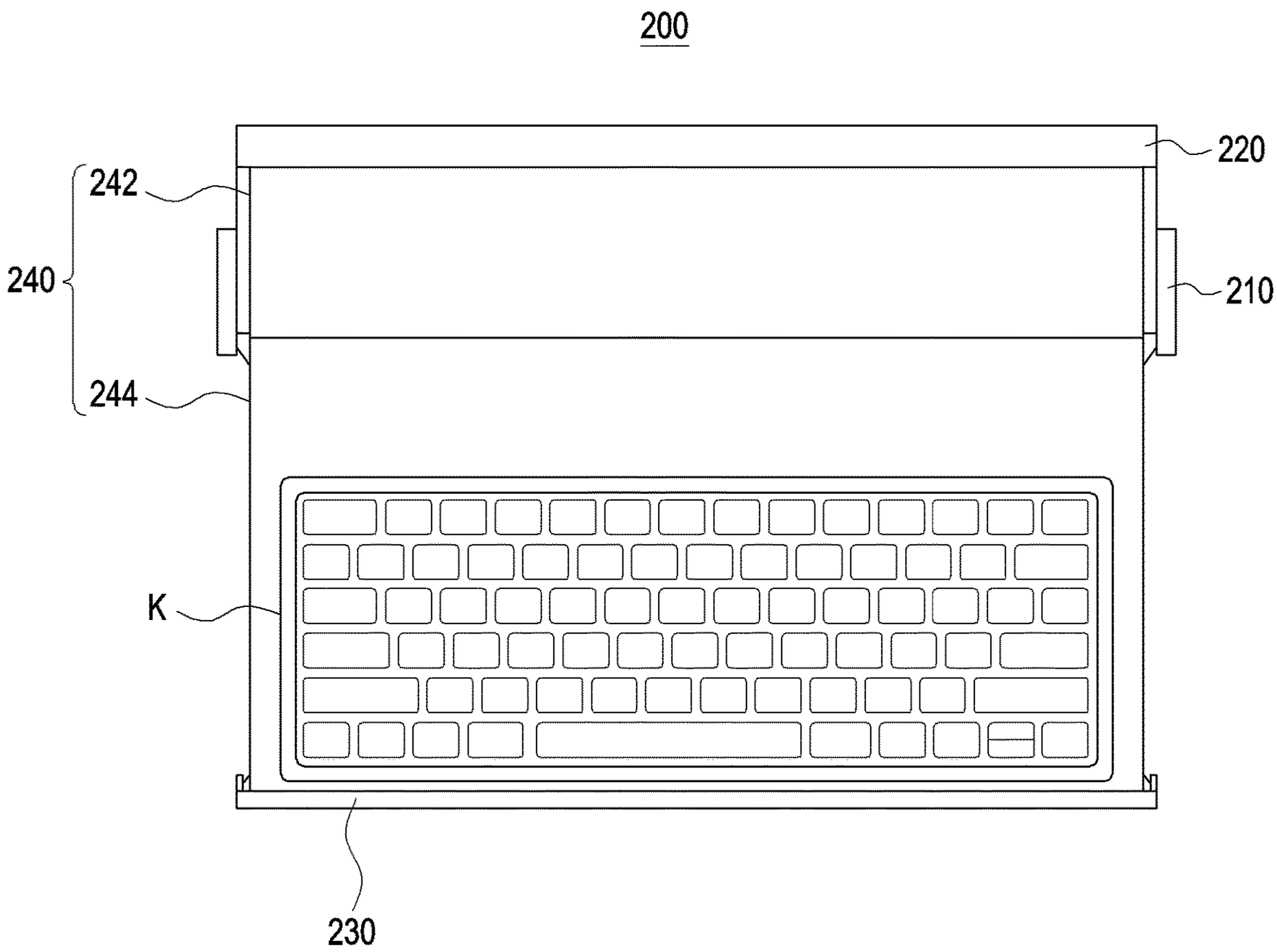

FIG.12

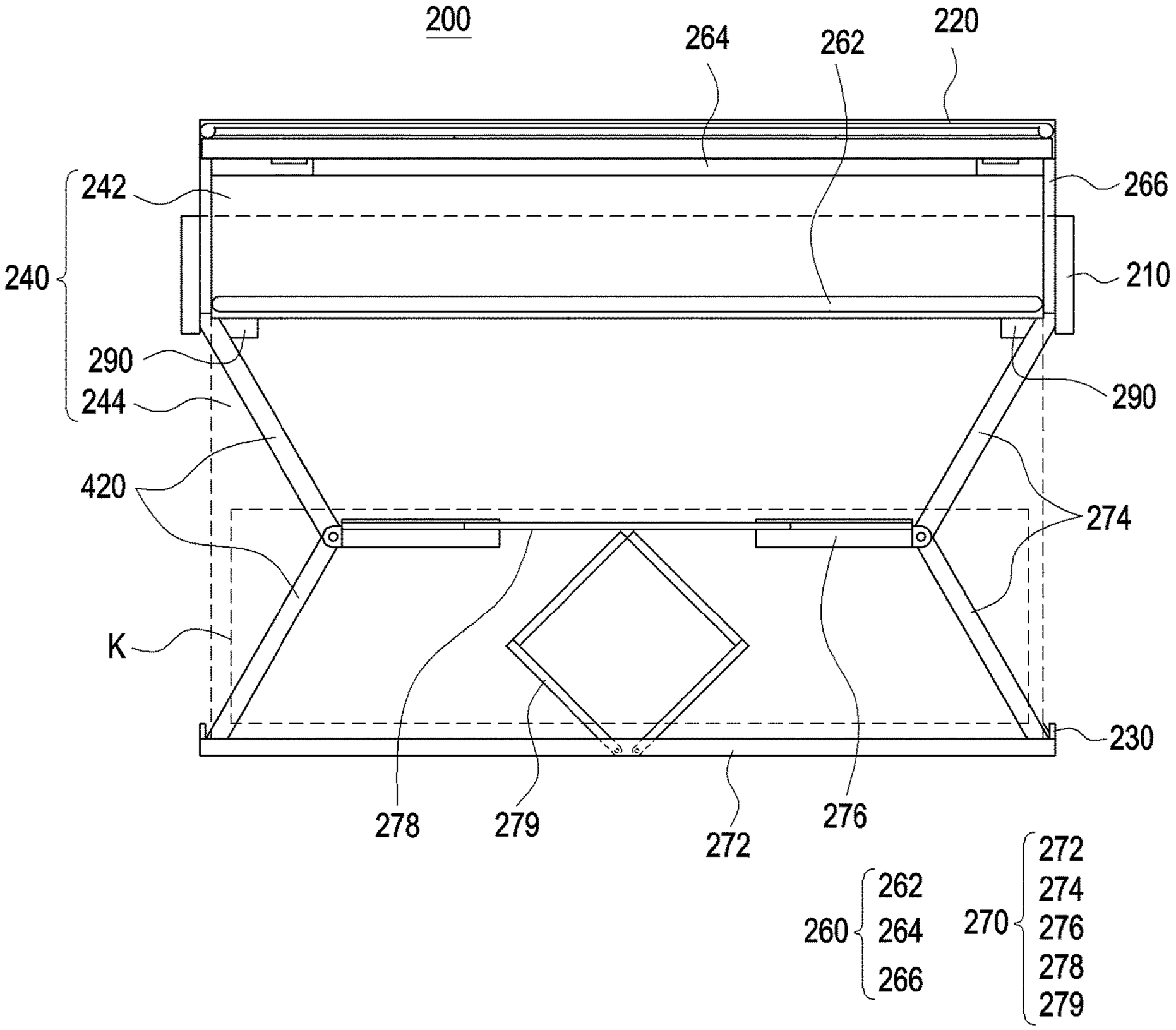
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FIG.13

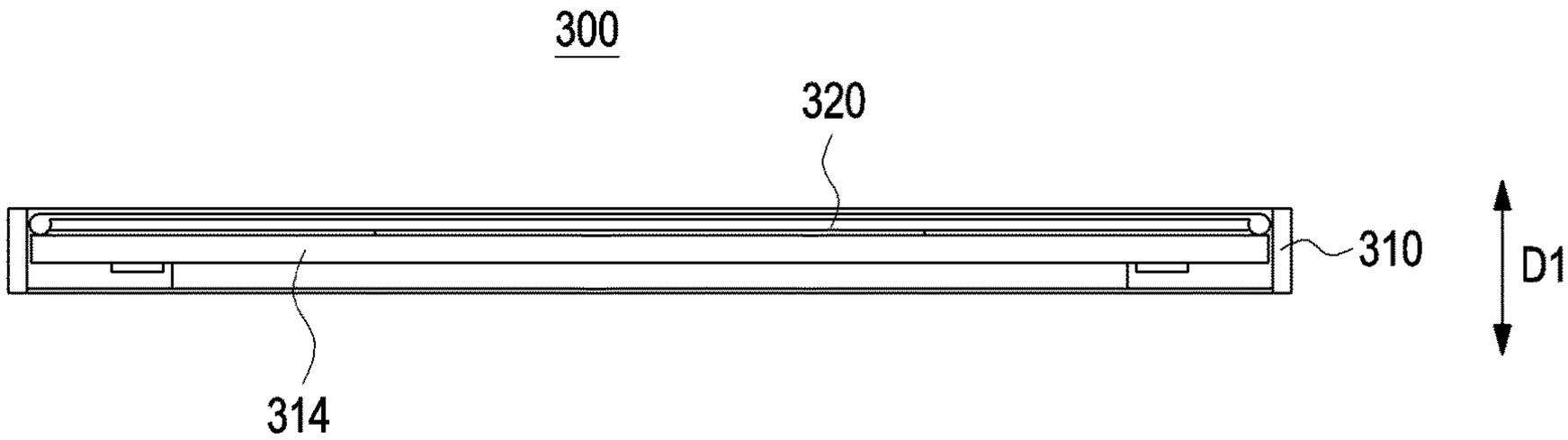


FIG.14A

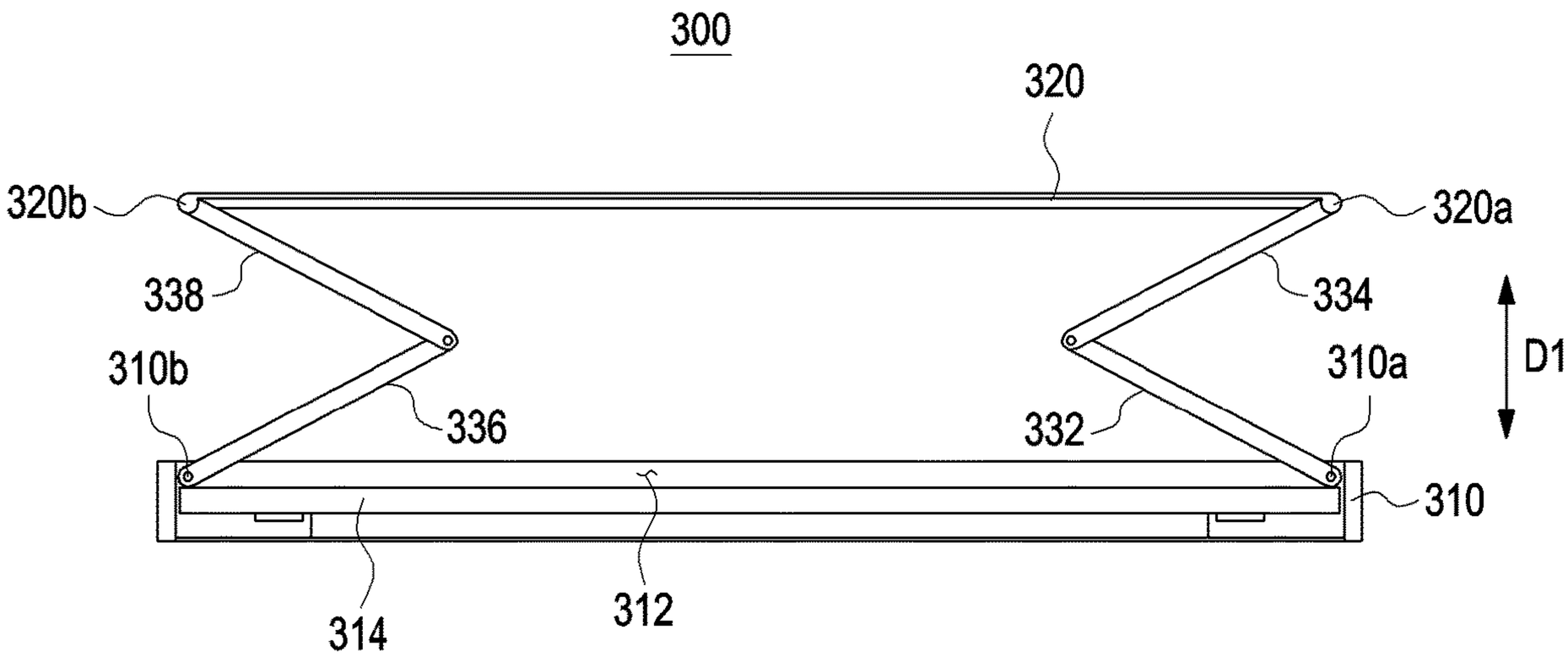
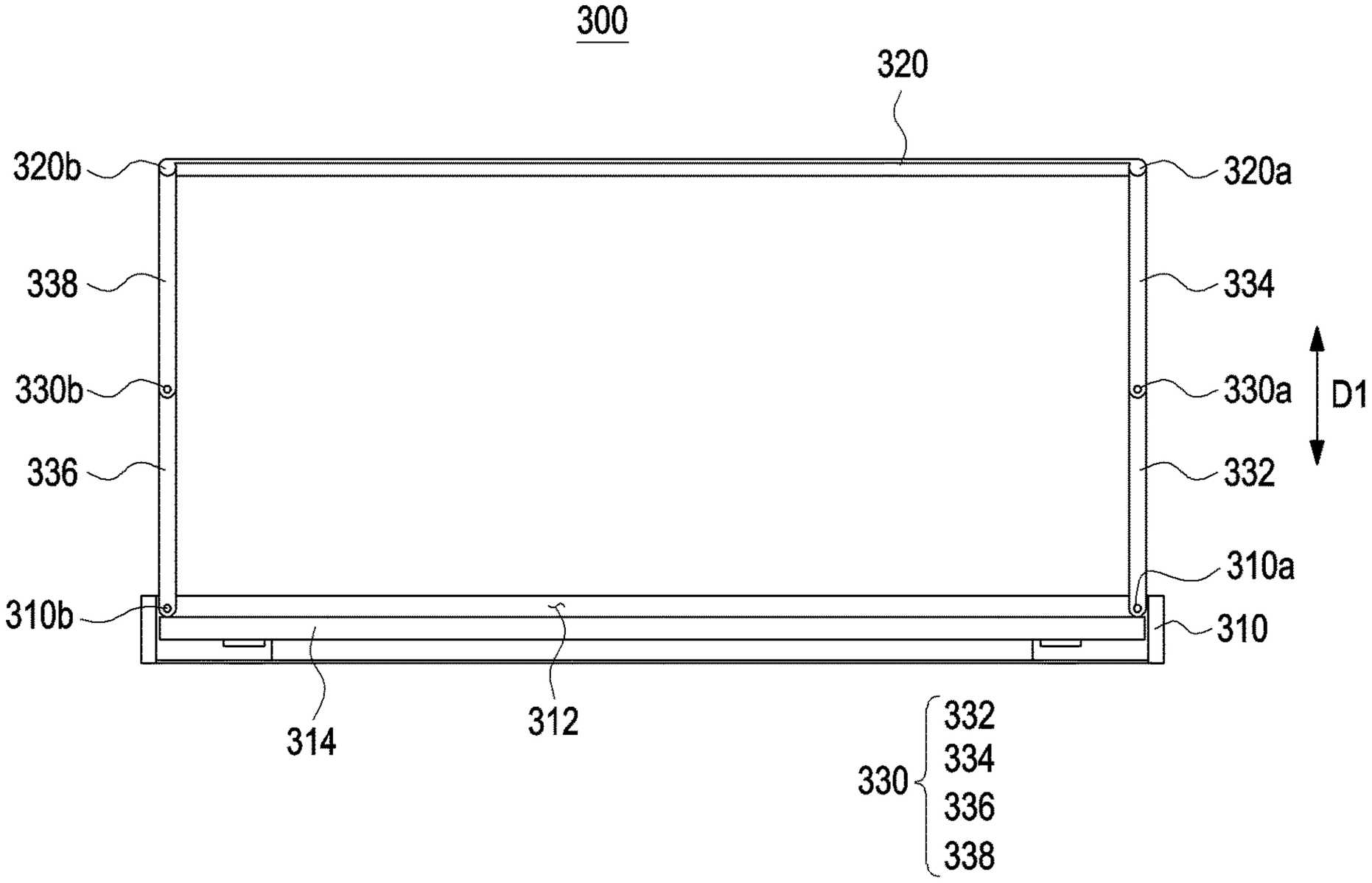


FIG.14B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338

FIG.14C

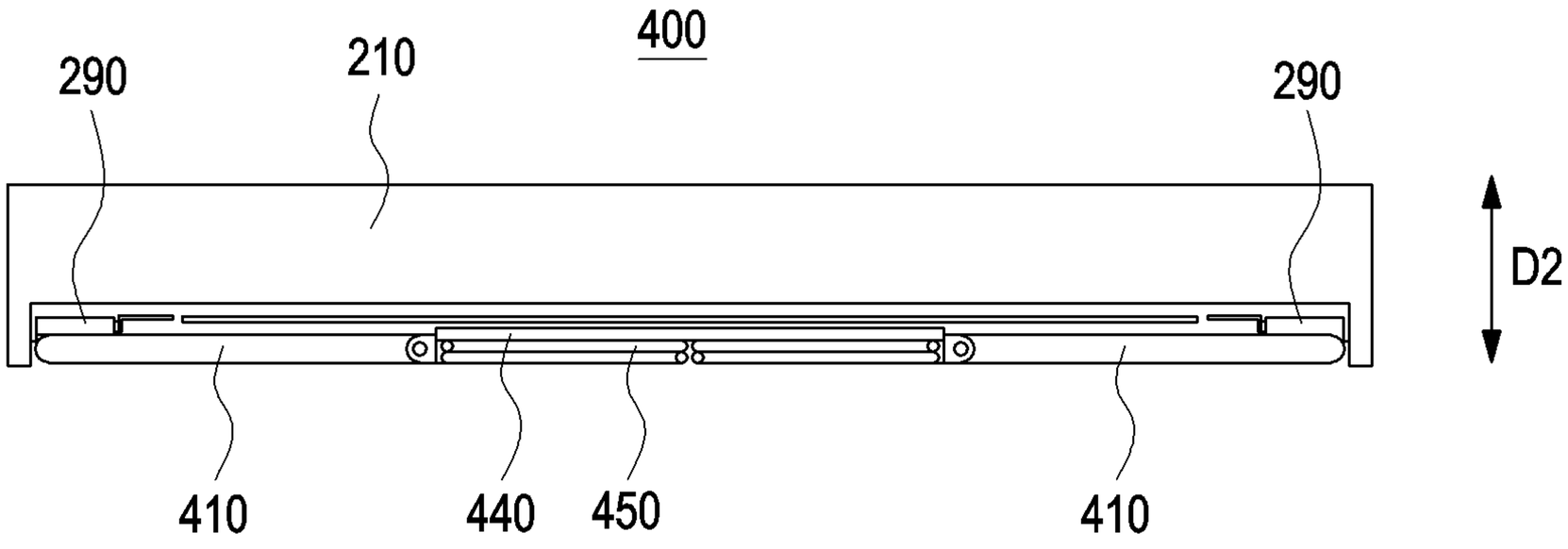


FIG.15A

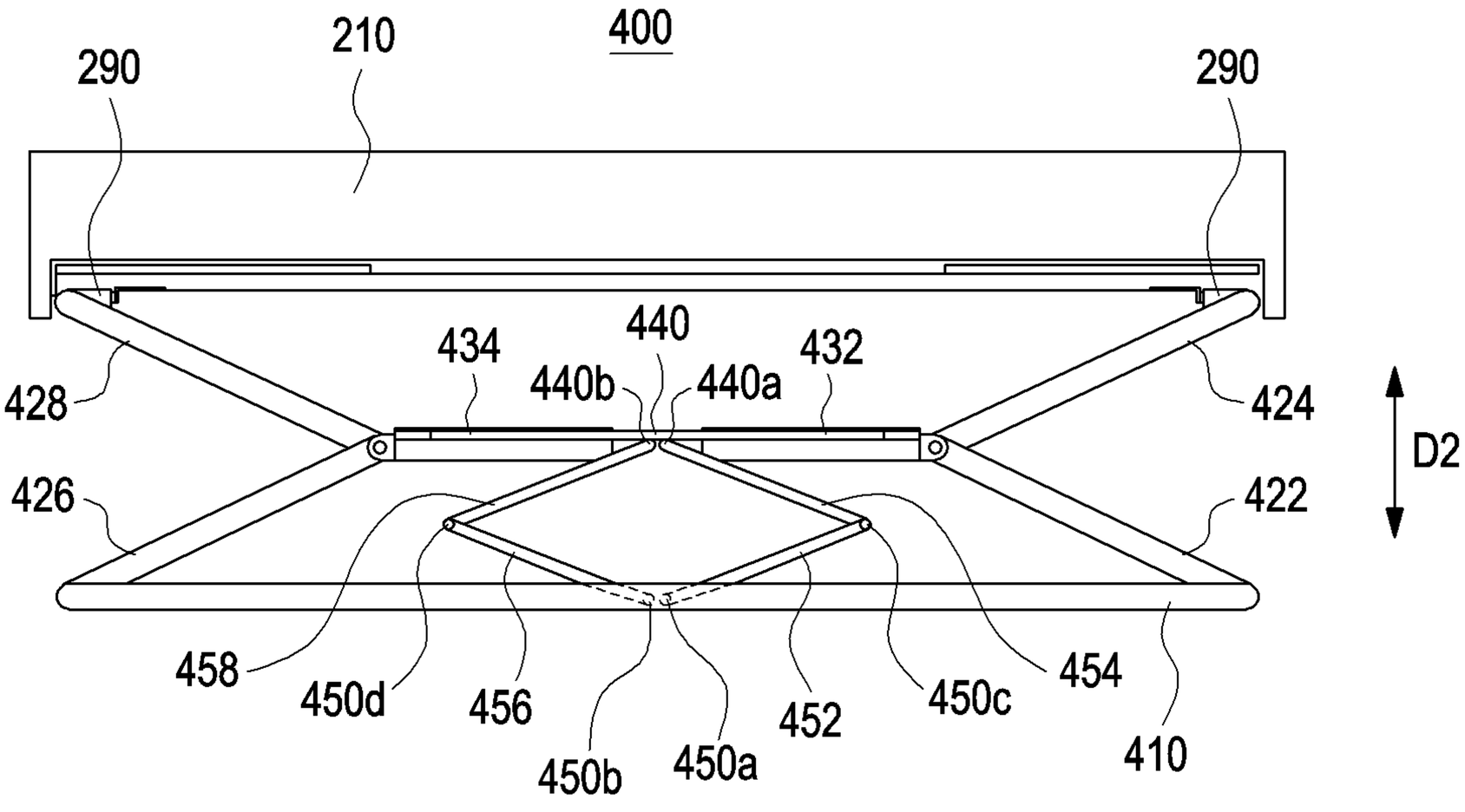
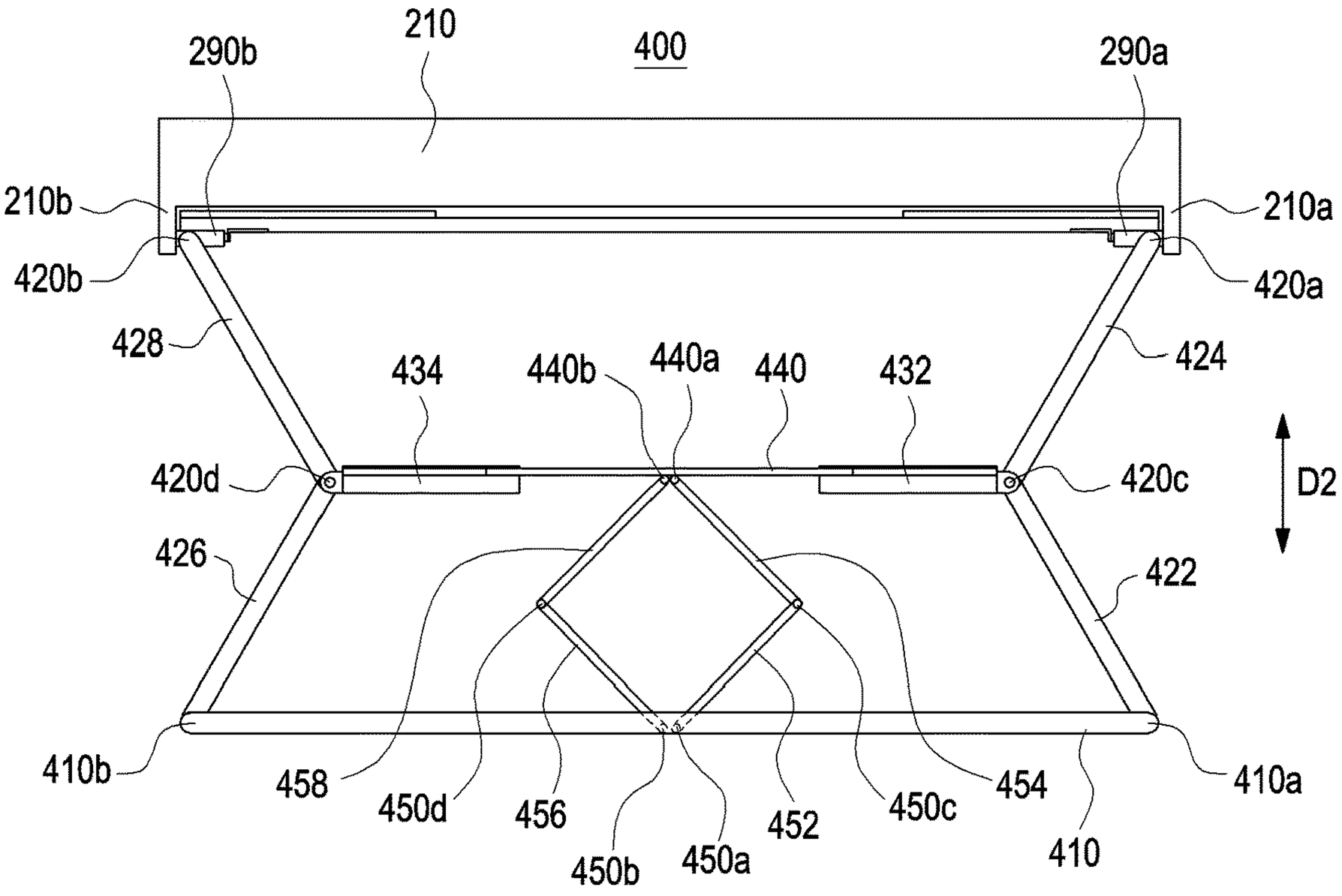


FIG.15B



420 { 422, 424, 426, 428 }
450 { 452, 454, 456, 458 }
430 { 432, 434 }
290 { 290a, 290b }

FIG.15C

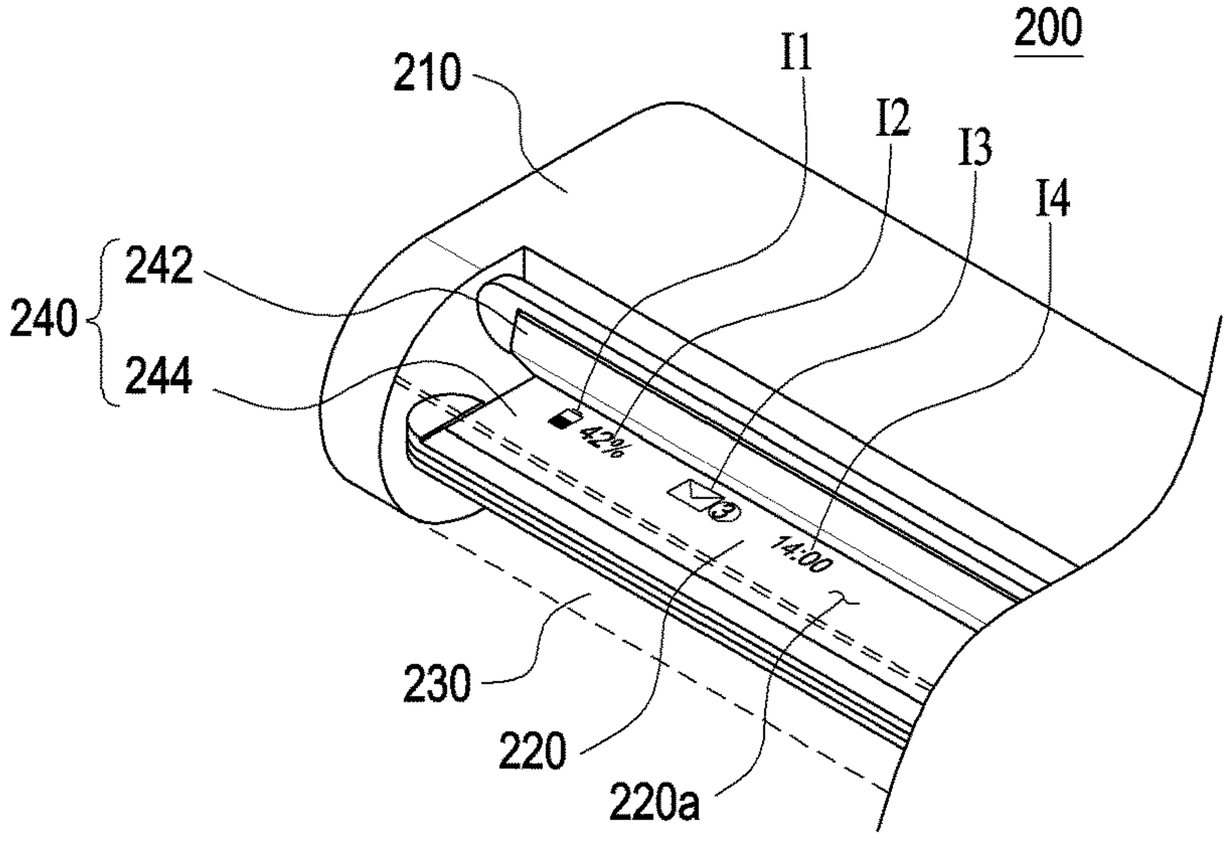


FIG.16

ELECTRONIC DEVICE INCLUDING ROLLER

CROSS-REFERENCE TO RELATED APPLICATION(S)

This application is a continuation application, claiming priority under § 365(c), of an International application No. PCT/KR2021/016538, filed on Nov. 12, 2021, which is based on and claims the benefit of a Korean patent application number 10-2020-0150665, filed on Nov. 12, 2020, in the Korean Intellectual Property Office, the disclosures of which is incorporated by reference herein in its entirety.

TECHNICAL FIELD

Certain embodiments of the disclosure relate to an electronic device including a roller.

BACKGROUND ART

With the development of information and communication technology and semiconductor technology, a diversity of computing functions have been integrated into portable electronic devices. For example, portable electronic devices may execute core communication functions, and in addition, may also implement entertainment functions, such as playing games, multimedia functions, such as playing or recording music and videos, communication and security functions (e.g., for mobile banking), and calendar scheduling, and electronic payment functions (e.g., e-wallet operations). These electronic devices are now compact enough for users to carry conveniently.

As mobile communication services extend into multimedia service sectors, electronic devices have evolved to include larger displays. However, the increase in display size often results in larger devices, which degrades portability.

DISCLOSURE

Technical Problem

An electronic device (e.g., a laptop computer) may include a display with a flat surface, a curved surface, or both a flat and curved surface. Accordingly, there is a limitation in realizing a screen larger than the size of the electronic device, due to the fixed display structure. Accordingly, one solution may be found to this issue in electronic devices equipped with foldable or rollable displays.

Because the conventional electronic devices including rollable displays are provided in a scrolled shape, it may be difficult to implement a keyboard (e.g., as commonly integrated in a laptop). Furthermore, the omission of a keyboard reduces the utility of such a device. Accordingly, electronic devices including a foldable displays may encounter limitations in compactness of design.

According to certain embodiments of the disclosure, there is provided an electronic device including a display that may be wound around a roller in two layers.

According to certain embodiments of the disclosure, the electronic device may provide a display that is at least partly usable as a keyboard, by extending in different directions.

The disclosure is not limited to the foregoing embodiments but various modifications or changes may rather be made thereto without departing from the disclosure.

Technical Solution

According to certain embodiments of the disclosure, an electronic device may include a housing, a roller disposed in the housing, a first cover part configured to be detachable from the housing, a second cover part configured to be detachable from the housing, and a display including a first display area including a first end coupled with the first cover part, and a second display area including a second end coupled with the second cover part, wherein at least a portion of the first display area is configured to be wound around the roller while facing at least a portion of the second display area.

According to various embodiments of the disclosure, an electronic device may comprise a housing, a roller disposed in the housing, a first cover part configured to be detachable from the housing in a first direction, a second cover part configured to be detachable from the housing in a second direction different from the first direction, and a display including a first display area including a first end coupled with the first cover part and a second display area including a second end coupled with the second cover part and configured to be wound around the roller.

Advantageous Effects

According to certain embodiments of the disclosure, the electronic device may implement a display extendable in two directions using a display wound in two layers around a roller. As the display extends in different directions, a first portion of the display may be used as a keyboard, and a second portion may be used as a display. As a result, the user's convenience may be increased.

According to certain embodiments of the disclosure, the electronic device may stabilize unfolding/extension of a rollable display stays at a predetermined angle or the user's desired angle, using a hinge structure configured to adjust the extension direction of the rollable display.

According to certain embodiments of the disclosure, the electronic device may stabilize and maintain extension/unfolding of the display using a stopper structure capable of adjusting the rotation of the roller.

DESCRIPTION OF THE DRAWINGS

FIG. **1** is a block diagram illustrating an electronic device in a network environment according to certain embodiments of the disclosure;

FIG. **2** is a view illustrating an electronic device in a state in which a display is received in a housing, according to certain embodiments of the disclosure;

FIG. **3** is a view illustrating an electronic device in a state in which a portion of a display is visually exposed to the outside of a housing, according to certain embodiments of the disclosure;

FIGS. **4** and **5** are exploded perspective views illustrating an electronic device according to certain embodiments of the disclosure;

FIG. **6** is a cross-sectional view taken along line A-A' of FIG. **2**;

FIG. **7** is a cross-sectional view taken along line B-B' of FIG. **3**;

FIG. **8** is an enlarged view of area A of FIG. **7**;

FIG. **9** is a view illustrating an angle between a first display area and a second display area according to certain embodiments of the disclosure;

FIG. **10** is a perspective view illustrating a display wound around a roller according to certain embodiments of the disclosure;

FIG. **11** is a perspective view illustrating a roller except for a display according to certain embodiments of the disclosure;

FIG. **12** is a front view illustrating an electronic device in an unfolded state, according to certain embodiments of the disclosure;

FIG. **13** is a see-through view of the electronic device of FIG. **12**;

FIGS. **14**A, **14**B, and **14**C are views illustrating a first supporting bracket according to certain embodiments of the disclosure;

FIGS. **15**A, **15**B, and **15**C are views illustrating a second supporting bracket according to certain embodiments of the disclosure; and

FIG. **16** is a perspective view illustrating a first display area visually exposed through a first cover part according to certain embodiments of the disclosure.

MODE FOR INVENTION

FIG. **1** is a block diagram illustrating an electronic device in a network environment according to certain embodiments of the disclosure;

Referring to FIG. **1**, the electronic device **101** in the network environment **100** may communicate with an electronic device **102** via a first network **198** (e.g., a short-range wireless communication network), or an electronic device **104** or a server **108** via a second network **199** (e.g., a long-range wireless communication network). According to an embodiment, the electronic device **101** may communicate with the electronic device **104** via the server **108**. According to an embodiment, the electronic device **101** may include a processor **120**, memory **130**, an input module **150**, a sound output module **155**, a display module **160**, an audio module **170**, a sensor module **176**, an interface **177**, a connecting terminal **178**, a haptic module **179**, a camera module **180**, a power management module **188**, a battery **189**, a communication module **190**, a subscriber identification module (SIM) **196**, or an antenna module **197**. In some embodiments, at least one (e.g., the connecting terminal **178**) of the components may be omitted from the electronic device **101**, or one or more other components may be added in the electronic device **101**. According to an embodiment, some (e.g., the sensor module **176**, the camera module **180**, or the antenna module **197**) of the components may be integrated into a single component (e.g., the display module **160**).

The processor **120** may execute, for example, software (e.g., a program **140**) to control at least one other component (e.g., a hardware or software component) of the electronic device **101** coupled with the processor **120**, and may perform various data processing or computation. According to an embodiment, as at least part of the data processing or computation, the processor **120** may store a command or data received from another component (e.g., the sensor module **176** or the communication module **190**) in volatile memory **132**, process the command or the data stored in the volatile memory **132**, and store resulting data in non-volatile memory **134**. According to an embodiment, the processor **120** may include a main processor **121** (e.g., a central processing unit (CPU) or an application processor (AP)), or an auxiliary processor **123** (e.g., a graphics processing unit (GPU), a neural processing unit (NPU), an image signal processor (ISP), a sensor hub processor, or a communication processor (CP)) that is operable independently from, or in conjunction with, the main processor **121**. For example, when the electronic device **101** includes the main processor **121** and the auxiliary processor **123**, the auxiliary processor **123** may be configured to use lower power than the main processor **121** or to be specified for a designated function. The auxiliary processor **123** may be implemented as separate from, or as part of the main processor **121**.

The auxiliary processor **123** may control at least some of functions or states related to at least one component (e.g., the display module **160**, the sensor module **176**, or the communication module **190**) among the components of the electronic device **101**, instead of the main processor **121** while the main processor **121** is in an inactive (e.g., sleep) state, or together with the main processor **121** while the main processor **121** is in an active state (e.g., executing an application). According to an embodiment, the auxiliary processor **123** (e.g., an image signal processor or a communication processor) may be implemented as part of another component (e.g., the camera module **180** or the communication module **190**) functionally related to the auxiliary processor **123**. According to an embodiment, the auxiliary processor **123** (e.g., the neural processing unit) may include a hardware structure specified for artificial intelligence model processing. The artificial intelligence model may be generated via machine learning. Such learning may be performed, e.g., by the electronic device **101** where the artificial intelligence is performed or via a separate server (e.g., the server **108**). Learning algorithms may include, but are not limited to, e.g., supervised learning, unsupervised learning, semi-supervised learning, or reinforcement learning. The artificial intelligence model may include a plurality of artificial neural network layers. The artificial neural network may be a deep neural network (DNN), a convolutional neural network (CNN), a recurrent neural network (RNN), a restricted Boltzmann machine (RBM), a deep belief network (DBN), a bidirectional recurrent deep neural network (BRDNN), deep Q-network or a combination of two or more thereof but is not limited thereto. The artificial intelligence model may, additionally or alternatively, include a software structure other than the hardware structure.

The memory **130** may store various data used by at least one component (e.g., the processor **120** or the sensor module **176**) of the electronic device **101**. The various data may include, for example, software (e.g., the program **140**) and input data or output data for a command related thereto. The memory **130** may include the volatile memory **132** or the non-volatile memory **134**.

The program **140** may be stored in the memory **130** as software, and may include, for example, an operating system (OS) **142**, middleware **144**, or an application **146**.

The input module **150** may receive a command or data to be used by other component (e.g., the processor **120**) of the electronic device **101**, from the outside (e.g., a user) of the electronic device **101**. The input module **150** may include, for example, a microphone, a mouse, a keyboard, keys (e.g., buttons), or a digital pen (e.g., a stylus pen).

The sound output module **155** may output sound signals to the outside of the electronic device **101**. The sound output module **155** may include, for example, a speaker or a receiver. The speaker may be used for general purposes, such as playing multimedia or playing record. The receiver may be used for receiving incoming calls. According to an embodiment, the receiver may be implemented as separate from, or as part of the speaker.

The display module **160** may visually provide information to the outside (e.g., a user) of the electronic device **101**. The display module **160** may include, for example, a display, a hologram device, or a projector and control circuitry to control a corresponding one of the display, hologram device, and projector. According to an embodiment, the display **160**

may include a touch sensor configured to detect a touch, or a pressure sensor configured to measure the intensity of a force generated by the touch.

The audio module **170** may convert a sound into an electrical signal and vice versa. According to an embodiment, the audio module **170** may obtain the sound via the input module **150**, or output the sound via the sound output module **155** or a headphone of an external electronic device (e.g., an electronic device **102**) directly (e.g., wiredly) or wirelessly coupled with the electronic device **101**.

The sensor module **176** may detect an operational state (e.g., power or temperature) of the electronic device **101** or an environmental state (e.g., a state of a user) external to the electronic device **101**, and then generate an electrical signal or data value corresponding to the detected state. According to an embodiment, the sensor module **176** may include, for example, a gesture sensor, a gyro sensor, an atmospheric pressure sensor, a magnetic sensor, an acceleration sensor, a grip sensor, a proximity sensor, a color sensor, an infrared (IR) sensor, a biometric sensor, a temperature sensor, a humidity sensor, or an illuminance sensor.

The interface **177** may support one or more specified protocols to be used for the electronic device **101** to be coupled with the external electronic device (e.g., the electronic device **102**) directly (e.g., wiredly) or wirelessly. According to an embodiment, the interface **177** may include, for example, a high definition multimedia interface (HDMI), a universal serial bus (USB) interface, a secure digital (SD) card interface, or an audio interface.

A connecting terminal **178** may include a connector via which the electronic device **101** may be physically connected with the external electronic device (e.g., the electronic device **102**). According to an embodiment, the connecting terminal **178** may include, for example, a HDMI connector, a USB connector, a SD card connector, or an audio connector (e.g., a headphone connector).

The haptic module **179** may convert an electrical signal into a mechanical stimulus (e.g., a vibration or motion) or electrical stimulus which may be recognized by a user via his tactile sensation or kinesthetic sensation. According to an embodiment, the haptic module **179** may include, for example, a motor, a piezoelectric element, or an electric stimulator.

The camera module **180** may capture a still image or moving images. According to an embodiment, the camera module **180** may include one or more lenses, image sensors, image signal processors, or flashes.

The power management module **188** may manage power supplied to the electronic device **101**. According to an embodiment, the power management module **188** may be implemented as at least part of, for example, a power management integrated circuit (PMIC).

The battery **189** may supply power to at least one component of the electronic device **101**. According to an embodiment, the battery **189** may include, for example, a primary cell which is not rechargeable, a secondary cell which is rechargeable, or a fuel cell.

The communication module **190** may support establishing a direct (e.g., wired) communication channel or a wireless communication channel between the electronic device **101** and the external electronic device (e.g., the electronic device **102**, the electronic device **104**, or the server **108**) and performing communication via the established communication channel. The communication module **190** may include one or more communication processors that are operable independently from the processor **120** (e.g., the application processor (AP)) and supports a direct (e.g., wired) communication or a wireless communication. According to an embodiment, the communication module **190** may include a wireless communication module **192** (e.g., a cellular communication module, a short-range wireless communication module, or a global navigation satellite system (GNSS) communication module) or a wired communication module **194** (e.g., a local area network (LAN) communication module or a power line communication (PLC) module). A corresponding one of these communication modules may communicate with the external electronic device via a first network **198** (e.g., a short-range communication network, such as Bluetooth™, wireless-fidelity (Wi-Fi) direct, or infrared data association (IrDA)) or a second network **199** (e.g., a long-range communication network, such as a legacy cellular network, a 5G network, a next-generation communication network, the Internet, or a computer network (e.g., local area network (LAN) or wide area network (WAN)). These various types of communication modules may be implemented as a single component (e.g., a single chip), or may be implemented as multi components (e.g., multi chips) separate from each other. The wireless communication module **192** may identify or authenticate the electronic device **101** in a communication network, such as the first network **198** or the second network **199**, using subscriber information (e.g., international mobile subscriber identity (IMSI)) stored in the subscriber identification module **196**.

The wireless communication module **192** may support a 5G network, after a 4G network, and next-generation communication technology, e.g., new radio (NR) access technology. The NR access technology may support enhanced mobile broadband (eMBB), massive machine type communications (mMTC), or ultra-reliable and low-latency communications (URLLC). The wireless communication module **192** may support a high-frequency band (e.g., the mmWave band) to achieve, e.g., a high data transmission rate. The wireless communication module **192** may support various technologies for securing performance on a high-frequency band, such as, e.g., beamforming, massive multiple-input and multiple-output (massive MIMO), full dimensional MIMO (FD-MIMO), array antenna, analog beam-forming, or large scale antenna. The wireless communication module **192** may support various requirements specified in the electronic device **101**, an external electronic device (e.g., the electronic device **104**), or a network system (e.g., the second network **199**). According to an embodiment, the wireless communication module **192** may support a peak data rate (e.g., 20 Gbps or more) for implementing eMBB, loss coverage (e.g., 164 dB or less) for implementing mMTC, or U-plane latency (e.g., 0.5 ms or less for each of downlink (DL) and uplink (UL), or a round trip of 1 ms or less) for implementing URLLC.

The antenna module **197** may transmit or receive a signal or power to or from the outside (e.g., the external electronic device). According to an embodiment, the antenna module may include an antenna including a radiator formed of a conductor or conductive pattern formed on a substrate (e.g., a printed circuit board (PCB)). According to an embodiment, the antenna module **197** may include a plurality of antennas (e.g., an antenna array). In this case, at least one antenna appropriate for a communication scheme used in a communication network, such as the first network **198** or the second network **199**, may be selected from the plurality of antennas by, e.g., the communication module **190**. The signal or the power may then be transmitted or received between the communication module **190** and the external electronic device via the selected at least one antenna. According to an embodiment, other parts (e.g., radio frequency integrated

circuit (RFIC)) than the radiator may be further formed as part of the antenna module **197**.

According to certain embodiments, the antenna module **197** may form a mmWave antenna module. According to an embodiment, the mmWave antenna module may include a printed circuit board, a RFIC disposed on a first surface (e.g., the bottom surface) of the printed circuit board, or adjacent to the first surface and capable of supporting a designated high-frequency band (e.g., the mmWave band), and a plurality of antennas (e.g., array antennas) disposed on a second surface (e.g., the top or a side surface) of the printed circuit board, or adjacent to the second surface and capable of transmitting or receiving signals of the designated high-frequency band.

At least some of the above-described components may be coupled mutually and communicate signals (e.g., commands or data) therebetween via an inter-peripheral communication scheme (e.g., a bus, general purpose input and output (GPIO), serial peripheral interface (SPI), or mobile industry processor interface (MIPI)).

According to an embodiment, commands or data may be transmitted or received between the electronic device **101** and the external electronic device **104** via the server **108** coupled with the second network **199**. The external electronic devices **102** or **104** each may be a device of the same or a different type from the electronic device **101**. According to an embodiment, all or some of operations to be executed at the electronic device **101** may be executed at one or more of the external electronic devices **102**, **104**, or **108**. For example, if the electronic device **101** should perform a function or a service automatically, or in response to a request from a user or another device, the electronic device **101**, instead of, or in addition to, executing the function or the service, may request the one or more external electronic devices to perform at least part of the function or the service. The one or more external electronic devices receiving the request may perform the at least part of the function or the service requested, or an additional function or an additional service related to the request, and transfer an outcome of the performing to the electronic device **101**. The electronic device **101** may provide the outcome, with or without further processing of the outcome, as at least part of a reply to the request. To that end, a cloud computing, distributed computing, mobile edge computing (MEC), or client-server computing technology may be used, for example. The electronic device **101** may provide ultra-low-latency services using, e.g., distributed computing or mobile edge computing. In another embodiment, the external electronic device **104** may include an internet-of-things (IoT) device. The server **108** may be an intelligent server using machine learning and/or a neural network. According to an embodiment, the external electronic device **104** or the server **108** may be included in the second network **199**. The electronic device **101** may be applied to intelligent services (e.g., smart home, smart city, smart car, or health-care) based on 5G communication technology or IoT-related technology.

The electronic device according to certain embodiments of the disclosure may be one of various types of electronic devices. The electronic devices may include, for example, a portable communication device (e.g., a smart phone), a computer device, a portable multimedia device, a portable medical device, a camera, a wearable device, or a home appliance. According to an embodiment of the disclosure, the electronic devices are not limited to those described above.

It should be appreciated that certain embodiments of the present disclosure and the terms used therein are not intended to limit the technological features set forth herein to particular embodiments and include various changes, equivalents, or replacements for a corresponding embodiment. With regard to the description of the drawings, similar reference numerals may be used to refer to similar or related elements. It is to be understood that a singular form of a noun corresponding to an item may include one or more of the things, unless the relevant context clearly indicates otherwise. As used herein, each of such phrases as "A or B," "at least one of A and B," "at least one of A or B," "A, B, or C," "at least one of A, B, and C," and "at least one of A, B, or C," may include all possible combinations of the items enumerated together in a corresponding one of the phrases. As used herein, such terms as "1st" and "2nd," or "first" and "second" may be used to simply distinguish a corresponding component from another, and does not limit the components in other aspect (e.g., importance or order). It is to be understood that if an element (e.g., a first element) is referred to, with or without the term "operatively" or "communicatively", as "coupled with," "coupled to," "connected with," or "connected to" another element (e.g., a second element), it means that the element may be coupled with the other element directly (e.g., wiredly), wirelessly, or via a third element.

As used herein, the term "module" may include a unit implemented in hardware, software, or firmware, and may interchangeably be used with other terms, for example, "logic," "logic block," "part," or "circuitry". A module may be a single integral component, or a minimum unit or part thereof, adapted to perform one or more functions. For example, according to an embodiment, the module may be implemented in a form of an application-specific integrated circuit (ASIC).

According to certain embodiments, each component (e.g., a module or a program) of the above-described components may include a single entity or multiple entities. Some of the plurality of entities may be separately disposed in different components. According to certain embodiments, one or more of the above-described components may be omitted, or one or more other components may be added. Alternatively or additionally, a plurality of components (e.g., modules or programs) may be integrated into a single component. In such a case, according to certain embodiments, the integrated component may still perform one or more functions of each of the plurality of components in the same or similar manner as they are performed by a corresponding one of the plurality of components before the integration. According to certain embodiments, operations performed by the module, the program, or another component may be carried out sequentially, in parallel, repeatedly, or heuristically, or one or more of the operations may be executed in a different order or omitted, or one or more other operations may be added.

FIG. **2** is a view illustrating an electronic device in a state in which a display is received in a housing, according to certain embodiments of the disclosure. FIG. **3** is a view illustrating an electronic device in a state in which a portion of a display is visually exposed to the outside of a housing, according to certain embodiments of the disclosure.

According to certain embodiments, the electronic device **200** may be a laptop computer, a notebook computer, or a portable terminal.

Referring to FIGS. **2** and **3**, the electronic device **200** may include a housing **210**, a display **240**, a first cover part **220**, and a second cover part **230**. The configuration of the

electronic device **200** of FIGS. **2** and **3** may be identical in whole or part to the configuration of the electronic device **101** of FIG. **1**.

According to certain embodiments, the housing **210** may form at least a portion of the exterior of the electronic device **200**. According to an embodiment, the housing **210** may receive at least some of the components (e.g., the roller **250** of FIG. **4**) of the electronic device **200**. According to an embodiment, the housing **210** may be formed of a metallic material or a non-metallic material having a predesignated magnitude of rigidity.

According to certain embodiments, the electronic device **200** may include at least one connection terminal **212** formed on an outer surface of the housing **210**. According to an embodiment, the connecting terminal **212** may receive power from an external electronic device (e.g., the electronic device **102** of FIG. **1**) and may transfer the received power to the battery (e.g., the electronic component **202** in FIG. **6**) of the electronic device **200**. According to an embodiment, the configuration of the connecting terminal **212** of FIG. **3** may be identical in whole or part to the configuration of the connecting terminal **178** of FIG. **1**.

According to certain embodiments, the first cover part **220** and/or the second cover part **230** may form a portion of the exterior of the electronic device **200**.

According to certain embodiments, the first cover part **220** and/or the second cover part **230** may be configured to be detachable from the housing **210**. For example, in a state (e.g., FIG. **2**) in which the display **240** is received in the housing **210**, the first cover part **220** and/or the second cover part **230** may be positioned adjacent to or in contact with the housing **210** and, in a state (e.g., FIG. **3**) in which a portion of the display **240** is visually exposed to the outside of the housing **210**, the first cover part **220** and/or the second cover part **230** may be spaced apart from the housing **210**. According to an embodiment, the first cover part **220** and/or the second cover part **230** may be distanced from the housing **210** by receiving an external force from the user moving the same away from the housing **210**, and subsequently, at least a portion of the display **240** connected with the first cover part **220** and the second cover part **230** may be extended to an exterior of the housing **210**.

According to certain embodiments, the electronic device **200** may include an input structure **214** for changing the state of the electronic device **200**. According to an embodiment, at least a portion of the input structure **214** may be extended out of the housing **210**. According to an embodiment, the input structure **214** may be moved based on a user input. For example, if pressure is applied to the input structure **214**, the input structure **214** may transfer at least a portion of the pressure to a component (e.g., the stopper structure **258** of FIG. **11**) for fixing the position of the display **240**.

According to certain embodiments, the display **240** may include a flexible display, at least a partial area of which may be transformed into a flat or curved surface. For example, the display **240** may be a foldable or rollable display. The configuration of the display **240** may be identical in whole or in part to the configuration of the display module **160** of FIG. **1**.

According to certain embodiments, the display **240** may include a touch detection circuit, a pressure sensor capable of measuring the strength (i.e., a pressure level) of touch contacts, and/or a digitizer configured to detect a magnetic field-type stylus pen.

According to certain embodiments, the display **240** may be extended out of the electronic device **200** based on a movement of at least one of the first cover part **220** or the second cover part **230**. For example, if the electronic device **200** is folded (e.g., FIG. **2**), the display **240** in a rolled state may be disposed within a space formed by the housing **210**. As another example, if the electronic device **200** is unfolded as to be extended (e.g., as in FIG. **3**), at least a portion of the display **240** may be physically extended into an external environment of the electronic device **200**.

According to certain embodiments, the display **240** may be disposed, in a double-rolled structure, in the electronic device **200**. According to an embodiment, the display **240** may include a first display area **242** connected with the first cover part **220** and a second display area **224** connected with the second cover part **230**. According to an embodiment, the surfaces **222***a* and **222***b* for outputting the screen of the display **240** may face each other when they are rolled and stowed. For example, a first front surface **242***a* of the first display area **242** and a second front surface **244***a* of the second display area **244** may face one another when the display is rolled.

According to certain embodiments, the display **240** may output a different screen in each area. For example, the processor (e.g., the processor **120** of FIG. **1**) may drive different programs (e.g., the program **140** of FIG. **1**) in the first display area **242** and the second display area **244**. According to an embodiment, the second display area **244** may output a keyboard-shaped image "K" for guiding reception of the user input. The processor **120** may control the content output from at least one of the first display area **242** or the second display area **244** based on the user input received from the second display area **244**. According to an embodiment, the processor **120** may adjust the size of the keyboard-shaped image K based on the length of the second display area **244** that has been extended into an external environment of the electronic device **200**. According to another embodiment, the second display area **244** may output the keyboard-shaped image K at a predetermined size.

FIGS. **4** and **5** are exploded perspective views illustrating an electronic device according to certain embodiments of the disclosure.

Referring to FIGS. **4** and **5**, an electronic device **200** may include a housing **210**, a first cover part **220**, a second cover part **230**, a display **240**, a roller **250**, a first supporting bracket **260**, a second supporting bracket **270**, an elastic member **280**, a printed circuit board (not shown), and/or a hinge structure **290**. The configuration of the housing **210**, the first cover part **220**, the second cover part **230**, and the display **240** of FIGS. **4** and **5** may be identical in whole or part to the configuration of the housing **210**, the first cover part **220**, the second cover part **230**, and the display **240** of FIGS. **2** and **3**. For example, the display **240** may be electrically connected with a printed circuit board (not shown) on which an electronic component (e.g., the processor **120** of FIG. **1**) is mounted.

According to certain embodiments, the display **240** may be, in some configurations, wound around the roller **250**. According to an embodiment, the display **240** may be wound around the roller **250** in two layers. For example, at least a portion of the first display area **242** may be wound around the roller **250** while facing at least a portion of the second display area **244**. According to some embodiments, the roller **250** may include a central area **250***a* having a cylindrical shape. The display **240** may be wound around the central area **250***a*. The central area **250***a* may be positioned between a plurality of end areas **250***b*. According to an embodiment, the central area **250***a* of the roller **250** may be formed in

various shapes. For example, the central area **250***a* of the roller **250** may be formed in a cylindrical shape, an elliptical column shape, and/or a polygonal (e.g., triangular, rectangular, pentagonal, hexagonal, or heptagonal) column shape.

According to certain embodiments, the roller **250** may be disposed in the housing **210**. According to an embodiment, the roller **250** may support at least a portion of the display **240** while at least a portion of the display **240** is received in the housing **210**.

According to certain embodiments, the electronic device **200** may include at least one spring structure **254** configured to provide an elastic force to the roller **250**. According to an embodiment, the spring structure **254** may provide an elastic force to the roller **250** in a direction in which the display **240** is received in the housing **210** (e.g., via retraction). According to an embodiment, the spring structure **254** may be connected with at least one of the end areas **250***b* of the roller **250**. For example, the spring structure **254** may include a coil spring, a leaf spring, a torsion spring, a compression spring (mainspring), and/or a rubber spring.

According to certain embodiments, the electronic device **200** may include at least one damping member **256** for adjusting a rotational speed of the roller **250**. According to an embodiment, the damping member **256** may include oil. Using the viscous resistance of the oil, the damping member **256** may adjust the rotation speed of the roller **250**, by the spring structure **254** (e.g., to a value lower than the implicit value resultant from the elastic force). According to an embodiment, the damping member **256** may be connected with at least one of the end areas **250***b* of the roller **250**. As another example, the damping member **256** may include an elastic member (e.g., rubber) and reduce the rotation speed of the roller **250** via contact resistance (e.g., frictional force) of the elastic member.

According to certain embodiments, the electronic device **200** may include a stopper structure **258** for adjusting the rotation of the roller **250**. According to an embodiment, the stopper structure **258** may contact a portion (e.g., a protrusion **252** in FIG. **6**) of the roller **250**, thereby limiting movement in the direction in which the display **240** is received into the housing **210**. The display **240** may thus be maintained in an unfolded state by the stopper structure **258**, with the display extended to a length either to a mechanically maximum, or to a shorter, custom length set by the user.

According to certain embodiments, the electronic device **200** may include an input structure **214** for controlling the movement of the stopper structure **258**. According to an embodiment, a portion of the input structure **214** may be exposed to the external environment of the housing **210**, and another portion thereof may be connected to the stopper structure **258**. If pressure is applied to the input structure **214** by the user, the stopper structure **258** may be spaced apart from the roller **250**, and the display **240** may be retracted into the housing **210**. According to an embodiment, the input structure **214** may change the position of the stopper structure **258** with respect to the plurality of protrusions **252** based on the user input.

According to certain embodiments, the first supporting bracket **260** may support a portion of the display **240** (e.g., the first display area **242**). For example, in a state in which a portion of the display **240** is extended and thus visible outside of the housing **210**, the first supporting bracket **260** may support at least a portion of the rear surface (e.g., the second surface **242***b* of FIG. **7**) of the first display area **242**.

According to certain embodiments, the distance between the first cover part **220** and the housing **210** may be changed based on the movement of the first supporting bracket **260**. For example, the first supporting bracket **260** may guide sliding of the first cover part **220** relative to the housing **210**. For example, the first supporting bracket **260** may include a first supporting member **262** connected with the housing **210**, a second supporting member **264** connected to the display **240**, and a first bar **266** connected with the first cover part **220** and the first supporting member **262**. The first bar **266** may include a plurality of first bars **266-1** and **266-2**, and the plurality of first bars **266-1** and **266-2** may be rotated with respect to a point (e.g., the first point **330***a* of FIG. **14**C). The structure of the first supporting bracket **260** is described in further detail below, with reference to FIGS. **14**A, **14**B and **14**C.

According to certain embodiments, the second supporting bracket **270** may support a portion of the display **240** (e.g., the second display area **244**). For example, in a state in which a portion of the display **240** is extended and thus visible to the external environment of the housing **210**, the second supporting bracket **270** may support at least a portion of the rear surface (e.g., the fourth surface **244***b* of FIG. **7**) of the second display area **244**.

According to certain embodiments, the distance between the second cover part **230** and the housing **210** may be changed based on the movement of the second supporting bracket **270**. For example, the second supporting bracket **270** may guide the second cover part **230** to slide with respect to the housing **210**. According to an embodiment, the second supporting bracket **270** may include a third supporting member **272** connected with the housing **210**, a second bar **274** connected with the second cover part **230**, a guide member **276** connected with the second bar **274**, a fourth supporting member **278** at least partially receivable in the guide member **276**, and a third bar **279** connected with the fourth supporting member **278** and the second cover part **230**. The second bar **274** may include a plurality of second bars **274-1** and **274-2**. The second bar **274** may rotate with respect to a point (e.g., the point **274***c* of FIG. **7**), and the third bar **279** connected with the fourth supporting member **278** may rotate with respect to a point (e.g., the seventh point **450***c* or the eighth point **450***d* of FIG. **15**C). The guide member **276** may include a plurality of guide members **276-1** and **276-2**. The third bar **279** may include a plurality of third bars **279-1** and **279-2**. The structure of the second supporting bracket **270** is described in detail with reference to FIGS. **15**A, **15**B and **15**C.

According to certain embodiments, an elastic member **280** may connect the display **240** to the roller **250**. For example, the elastic member **280** may include a third end **282** connected with the display **240**, and a fourth end **284** positioned opposite the third end **282** and connected with the roller **250**. According to an embodiment, the elastic member **280** may include a fiber or leaf spring. According to an embodiment, the elastic member **280** may be formed in various shapes. For example, in FIG. **5**, the elastic member **280** is depicted in the example shape of a flat plate, but other embodiments are contemplated in the disclosure. Furthermore, the elastic member **280** may include a plurality of elastic members (not shown).

According to certain embodiments, the hinge structure **290** may rotatably connect the second supporting bracket **270** to the housing **210**. For example, the hinge structure **290** may be disposed on the housing **210**, and may support the plurality of second bars **274** of the second supporting bracket **270**. According to an embodiment, the hinge structure **290** may include a detent structure (not shown) that provides a frictional force capable of maintaining a constant

angle when supporting the load of the display **240** and/or the second supporting bracket **270**. According to an embodiment, there may be provided a plurality of hinge structures **290**. For example, the hinge structure **290** may include a plurality of hinge structures **290-1** and **290-2**.

FIG. **6** is a cross-sectional view taken along line A-A' of FIG. **2**. FIG. **7** is a cross-sectional view taken along line B-B' of FIG. **3**. FIG. **8** is an enlarged view of area A of FIG. **7**. FIG. **9** is a view illustrating an angle between a first display area and a second display area according to certain embodiments of the disclosure. The configuration of the housing **210**, the input structure **214**, the first cover part **220**, the second cover part **230**, the display **240**, the roller **250**, the first supporting bracket **260**, the second supporting bracket **270**, and/or the elastic member **280** of FIGS. **6** to **9** may be identical in whole or part to the configuration of the housing **210**, the input structure **214**, the first cover part **220**, the second cover part **230**, the display **240**, the roller **250**, the first supporting bracket **260**, the second supporting bracket **270**, and/or the elastic member **280** of FIGS. **4** and **5**.

According to certain embodiments, the electronic device **200** may include an electronic component **202**. According to an embodiment, the electronic component **202** may include at least one of a battery (e.g., the battery **189** of FIG. **1**) or a printed circuit board (not shown) on which a processor (e.g., the processor **120** of FIG. **1**) is disposed. According to an embodiment, the electronic component **202** may be electrically connected with the display **240** using a flexible printed circuit board **206**.

According to certain embodiments, the electronic device **200** may include at least one antenna module (e.g., the antenna module **197** of FIG. **1**). According to an embodiment, the electronic device **200** may include at least one antenna module **197** disposed in the housing **210** of FIGS. **6** to **8**. According to an embodiment, at least a portion of the housing **210**, as an antenna radiator, may be electrically connected with a printed circuit board (not shown).

According to certain embodiments, the electronic device **200** may include at least one magnet **204**. According to an embodiment, the magnet **204** may include a first magnet **204***a* disposed in the first cover part **220** and a second magnet **204***b* disposed in the second cover part **230** and facing the first magnet **204***a*. According to an embodiment, the first cover part **220** and the second cover part **230** may be coupled using the magnet **204**. For example, the polarity of the first magnet **204***a* and the polarity of the second magnet **204***b* may be different.

According to certain embodiments, at least a portion of the housing **210** may face the first cover part **220** and the second cover part **230**. For example, the housing **210** may include a first surface **210***a* configured to face the first cover part **220** and the second cover part **230**. According to an embodiment, at least a portion of the first supporting bracket **260** and at least a portion of the second supporting bracket **270** may be disposed on the first surface **210***a* of the housing **210**.

According to certain embodiments, the display **240** may be coupled with the first cover part **220** and the second cover part **230**. For example, the display **240** may include a first display area **242** including a first end **241** coupled with the first cover part **220** and a second display area **244** including a second end **243** coupled with the second cover part **230**. The first end **241** may be coupled with the first cover part **220** through the first supporting bracket **260**, and the second end **243** may be coupled with the second cover part **230** through the second supporting bracket **270**.

According to certain embodiments, the display **240** may include a third display area **246** positioned between the first display area **242** and the second display area **244**. According to an embodiment, the third display area **246** may be defined as an area in which the display **240** is folded. According to an embodiment, the curvature of the display **240** may be limited to a predetermined curvature. For example, in a state (e.g., FIG. **6**) in which the display **240** is received in the housing **210**, the first front surface **242***a* of the first display area **242** and the second front surface **244***a* of the second display area **244** may be rolled around the roller **250** while facing each other, and the third display area **246** may be rolled around the roller **250** while being spaced apart.

According to certain embodiments, the roller **250** may include a plurality of protrusions **252**. According to an embodiment, the plurality of protrusions **252** may protrude from an end (e.g., the end area **250***b* of FIG. **5**) of the roller **250**. According to an embodiment, the plurality of protrusions **252** may contact the stopper structure **258**.

According to certain embodiments, the roller **250** may include a display receiving groove **253**. According to an embodiment, the display receiving groove **253** may receive at least a portion (e.g., the third display area **246**) of the display **240**. According to an embodiment, the display receiving groove **253** may be a groove formed along the length direction (e.g., the Y-axis direction) of the roller **250**.

According to certain embodiments, the stopper structure **258** may include a stopper portion **258***a* for contacting the plurality of protrusions **252**, a spring portion **258***b* connected with the housing **210**, a body portion **258***c* connected with the spring portion **258***b* and the input structure **214**, a rotation portion **258***d* disposed within an opening **214***a* of the input structure **214**, and an end **258***e* projecting from the body portion **258***c* toward the housing **210**. According to an embodiment, the display **240** and the end **258***e* of the body portion **258***c* may be spaced apart from the housing **210**.

According to certain embodiments, a movement of the display **240** may be controlled in part based on the stopper structure **258**. According to an embodiment, when the protrusion **252** is spaced apart from the stopper portion **258***a*, the roller **250** may be rotatable, and the display **240** is movable. If the pressure applied to the input structure **214** is reduced as compared with the elastic force of the spring portion **258***b*, the spring portion **258***b* may move downward (e.g., in the −Z direction), and the stopper portion **258***a* may contact the protrusion **252** of the roller **250**. According to an embodiment, with the protrusion **252** contacting the stopper portion **258***a*, the movement of the roller **250**, the first cover part **220**, and the second cover part **230** may be substantially limited. The movement of the display **240** based on the stopper structure **258** is described in detail with reference to FIGS. **10** and **11**.

According to certain embodiments, the first supporting bracket **260** may be detachable in a first direction D**1** with respect to the housing **210**. For example, the first supporting bracket **260** may include a first supporting member **262** connected with the housing **210**, a second supporting member **264** connected with the first cover part **220**, and a plurality of first bars **266** positioned between the first supporting member **262** and the second supporting member **264**. According to an embodiment, the plurality of first bars **266** may slide the first cover part **220** in the first direction D**1**. For example, the plurality of first bars **266** may include a 1-1th bar **266***a* connected with the housing **210** and/or the first supporting member **262** and a 1-2th bar **266***a* connected with the second supporting member **264**. The 1-1th bar **266***a*

and the 1-2th bar **266***b* may rotate with respect to a point **266***c* (e.g., the first point **330***a* and/or the second point **330***b* of FIG. **14**C).

According to certain embodiments, the second supporting bracket **270** may be detachable in a second direction D**2** with respect to the housing **210**. For example, the second supporting bracket **270** may include a third supporting member **272** connected with the second cover part **230**, and a plurality of second bars **274** connected with the housing **210** through a hinge structure **290**. According to an embodiment, the plurality of second bars **274** may slide the second cover part **230** in the second direction D**2**. For example, the plurality of second bars **274** may include a 2-1th bar **274***a* connected with the housing **210** and/or the hinge structure **290** and a 2-2th bar **274***b* connected with the third supporting member **272**. The 2-1th bar **274***a* and the 2-2th bar **274***b* may rotate with respect to a point **274***c* (e.g., the third point **420***c* and/or the fourth point **420***d* of FIG. **15**C). According to an embodiment, the second direction D**2** may be different from the first direction D**1** in which the first supporting bracket **260** moves with respect to the housing **210**.

According to certain embodiments, the elastic member **280** may be connected with the third display area **246**. For example, the elastic member **280** may include a third end **282** connected with the third display area **246** and a fourth end **284** connected with the roller **250**.

According to certain embodiments, the hinge structure **290** may be disposed on the housing **210** and may support the second supporting bracket **270**. For example, the hinge structure **290** may include a fixing part **292** disposed on the first surface **210***a* of the housing **210**, and a rotation bracket **294** rotating with respect to the fixing part **292** and supporting the second supporting bracket **270**.

According to certain embodiments, the angle between the first display area **242** and the second display area **244** may be varied. For example, the rotation bracket **294** may rotate at various angles with respect to the first surface **210***a* of the housing **210**. For example, a first angle x**1** between the rotation bracket **294** and the first surface **210***a* may be formed between 0 degrees and 180 degrees. According to an embodiment, the display **240** may be bent based on the hinge structure **290**. The second supporting bracket **270** connected with the rotation bracket **294**, and the second display area **244** connected with the rotation bracket **294** through the second supporting bracket **270** may be rotatable with respect to the first surface **210***a*. For example, a second angle x**2** between the first display area **242** and the second display area **244** may be substantially equal to the first angle x**1**. According to an embodiment (e.g., FIG. **9**), the first display area **242** and the second display area **244** may be positioned on substantially matching planes. For example, the first display area **242** and the second display area **244** may be implemented seamlessly.

FIG. **10** is a perspective view illustrating a display wound around a roller according to certain embodiments of the disclosure. FIG. **11** is a perspective view illustrating a roller except for a display according to certain embodiments of the disclosure.

Referring to FIGS. **10** and **11**, the electronic device **200** may control the movement of the roller **250** using the stopper structure **258**. The configuration of the input structure **214**, the display **240**, the roller **250**, the spring structure **254**, the damping member **256**, and the stopper structure **258** of FIGS. **10** and **11** may be identical in whole or part to the configuration of the input structure **214**, the display **240**, the roller **250**, the spring structure **254**, the damping member **256**, and the stopper structure **258** of FIG. **6**, and so, duplicative descriptions thereof will be omitted.

According to certain embodiments, at least a portion of the stopper structure **258** may rotate around the rotation portion **258***d*. According to an embodiment, if a pressure greater than the elastic force of the spring portion **258***b* is applied to the input structure **214**, the stopper structure **258** may rotate around the rotation portion **258***d* in a third direction D**3**, in which the spring portion **258***b* is compressed. For example, a portion of the body portion **258***c* disposed under the input structure **214** (e.g., the −Z direction) may move downward (e.g., the −Z direction), and the end **258***e* of the body portion **258***c* adjacent to the spring portion **258***b* may move upward (e.g., the +Z direction).

According to certain embodiments, if a pressure greater than the elastic force of the spring portion **258***b* is applied to the input structure **214**, the stopper portion **258***a* may be spaced apart from the protrusion **252** of the roller **250**, and the roller **250** may be rotatable. As the roller **250** rotates, at least a portion of the display **240** may be extended as to exit the housing **210** to an external environment. For example, if the user pulls the first cover part (e.g., the first cover part **220** of FIG. **6**) and/or the second cover part (e.g., the second cover part **230** of FIG. **6**), the first end **241** connected with the second supporting member **264** of the first cover part **220** and the second end **243** connected with the third supporting member **272** of the second cover part **230** may be moved in the direction spaced apart from the roller **250**.

According to certain embodiments, if a pressure greater than the elastic force of the spring portion **258***b* is not applied to the input structure **214**, the display **240** and/or the roller **250** may be substantially fixed. For example, the stopper portion **258***a* in contact with the protrusion **252** of the roller **250** may restrict rotation of the roller **250**, and the display **240** connected with the roller **250** will not rotate.

According to certain embodiments, if the pressure applied to the input structure **214** is smaller than the elastic force of the spring portion **258***b*, the spring portion **258***b* may move downward (e.g., in the −Z direction), and the stopper portion **258***a* may contact the protrusion **252** of the roller **250**. According to an embodiment, with the protrusion **252** contacting the stopper portion **258***a*, the movement of the roller **250**, the first cover part **220**, and the second cover part **230** may be substantially limited.

FIG. **12** is a front view illustrating an electronic device in an unfolded state, according to certain embodiments of the disclosure. FIG. **13** is a see-through view of the electronic device of FIG. **12**.

Referring to FIGS. **12** and **13**, the electronic device **200** may include a first supporting bracket **260** supporting the first display area **242** of the display **240** and a second supporting bracket **270** supporting the second display area **244** of the display **240**. Referring to FIGS. **12** and **13**, the configuration of the housing **210**, the first cover part **220**, the second cover part **230**, the display **240**, the first supporting bracket **260**, the second supporting bracket **270**, and the hinge structure **290** may be identical in whole or part to the configuration of the housing **210**, the first cover part **220**, the second cover part **230**, the display **240**, the first supporting bracket **260**, the second supporting bracket **270**, and the hinge structure **290** of FIGS. **6** to **9**.

According to certain embodiments, the first supporting bracket **260** may be connected with the housing **210** and the first cover part **220**. For example, the first supporting bracket **260** may include a first supporting member **262** connected with the first cover part **220**, a second supporting member **264** connected with the housing **210**, and a plurality of first

bars **266** disposed between the first supporting member **262** and the second supporting member **264**. According to an embodiment, the plurality of first bars **266** may rotate based on the distance between the first supporting member **262** and the second supporting member **264**. For example, the first bar **266** may be connected with the end of the first supporting member **262** or the end of the second supporting member **264** and may rotate about the end of the first supporting member **262** or the end of the second supporting member **264**.

According to certain embodiments, the second supporting bracket **270** may be connected with the housing **210** and the second cover part **230**. For example, the second supporting bracket **270** may include a third supporting member **272** connected with the second cover part **230**, a plurality of second bars connected with the hinge structure **290** disposed on the housing **210**, a guide member **276** connected with the second bar **274**, a fourth supporting member **278** at least partially received in the guide member **276**, and a third bar connected with the third supporting member **272** and the fourth supporting member **278**. According to an embodiment, at least a portion of the second supporting bracket **270** may support the portion of the display **240** that displays a keyboard-shaped image K. For example, the fourth supporting member **278** and the third bar **279** may be positioned under the display **240**, in a position corresponding to the keyboard-shaped image K of the second display area **244**.

FIGS. **14**A, **14**B, and **14**C are views illustrating a first supporting bracket according to certain embodiments of the disclosure.

Referring to FIGS. **14**A, **14**B, and **14**C, the first supporting bracket **300** may include a first supporting member **310** connected with a housing (e.g., the housing **210** of FIG. **13**), a second supporting member **320** connected with a first cover part (e.g., the first cover part **220** of FIG. **13**), and a plurality of first bars **330** connected with the first supporting member **310** and the second supporting member **320**. The configuration of the first supporting bracket **300**, the first supporting member **310**, the second supporting member **320**, and the first bar **330** of FIGS. **14**A, **14**B, and **14**C may be identical in whole or part to the configuration of the first supporting bracket **260**, the first supporting member **262**, the second supporting member **264**, and the first bar **266** of FIG. **13**.

According to certain embodiments, at least a portion of the first supporting bracket **300** is movable using a bar-linkage mechanism. For example, the first supporting bracket **300** may be moved along the first direction D**1** using the plurality of first bars **330** connected with the first supporting member **310** and the second supporting member **320** and may adjust the distance between the first supporting member **310** and the second supporting member **320**.

According to certain embodiments, the first supporting member **310** may include a fifth end **310***a* and a sixth end **310***b* opposite to the fifth end **310***a*. According to an embodiment, the first supporting member **310** may include a receiving groove **312** for receiving the second supporting member **320** and the plurality of first bars **330**. For example, in a state (e.g., FIG. **14**A) in which the display (e.g., the display **240** of FIG. **6**) is received in the housing (e.g., the housing **210** of FIG. **6**), the second supporting member **320** and the plurality of first bars **330** may be positioned in the receive groove **312** of the first supporting member **310**. According to an embodiment, the first supporting member **310** may include a protrusion **314** for restricting movement of the second supporting member **320** and/or the plurality of first bars **330**. For example, the protrusion **314** of the first supporting member **310** may restrict movement of the second supporting member **320** and/or the plurality of first bars **330** past a line defined by an edge of the first supporting member **310**. According to an embodiment, the first supporting member **310** may be integrally formed with the housing **210**.

According to certain embodiments, the second supporting member **320** may include a seventh end **320***a* and an eighth end **320***b*. According to an embodiment, the second supporting member **320** may support the first end (e.g., the first end **241** of FIG. **10**) of the display **240**. According to an embodiment, the second supporting member **320** may restrict the movement of the first bar **330**. For example, the second supporting member **320** may include a protrusion (not shown) and may restrict movement of the first bar **330** in the first direction D**1** past the second supporting member **320**.

According to certain embodiments, the first bar **330** may include a plurality of first bars **332**, **334**, **336**, and **338** disposed between the first supporting member **310** and the second supporting member **320**. For example, the first bar **330** may include a 1-1th bar **332** rotatably connected to the fifth end **310***a*, a 1-2th bar **334** rotatably connected with the seventh end **320***a*, a 1-3th bar **336** rotatably connected with the sixth end **310***b*, and a 1-4th bar **338** rotatably connected with the eighth end **320***b*.

According to certain embodiments, the plurality of first bars **332**, **334**, **336**, and **338** may rotate at a plurality of points, thereby adjusting the distance between the housing and/or the first supporting member **310** and the second supporting member **320**. According to an embodiment, the 1-1th bar **332** may be rotatably connected with the 1-2th bar **334** with respect to the first point **330***a* positioned between the fifth end **310***a* and the seventh end **320***a*. According to an embodiment, the 1-3th bar **336** may be rotatably connected with the 1-4th bar **338** with respect to the second point **330***b* positioned between the sixth end **310***b* and the eighth end **320***b*. According to an embodiment, the first point **330***a* may be an end of the 1-1th bar **332** and/or the 1-2th bar **334**. The first point **330***a* may be positioned opposite to the end of the 1-1th bar **332** connected with the fifth end **310***a* of the first supporting member **310**. According to an embodiment, the second point **330***b* may be an end of the 1-3th bar **336** and/or the 1-4th bar **338**. For example, the second point **330***b* may be positioned opposite to the end of the 1-3th bar **336** connected with the sixth end **310***b* of the first supporting member **310**.

FIGS. **15**A, **15**B, and **15**C are views illustrating a second supporting bracket according to certain embodiments of the disclosure.

Referring to FIGS. **15**A, **15**B, and **15**C, the second supporting bracket **400** may include a third supporting member **410** connected with a second cover part (e.g., the second cover part **230** of FIG. **13**) and a plurality of second bars **420** connected with a housing **210** and/or a hinge structure **290**. The configuration of the housing **210**, the hinge structure **290**, the second supporting bracket **400**, the third supporting member **410**, and the plurality of second bars **420** of FIGS. **15**A, **15**B, and **15**C may be identical in whole or part to the configuration of the housing **210**, the hinge structure **290**, the second supporting bracket **270**, the third supporting member **272**, and the plurality of second bars **274** of FIG. **13**.

According to certain embodiments, the hinge structure **290** may include a plurality of hinge structures **290***a* and **290***b*. For example, the hinge structure **290** may include a first hinge structure **290***a* adjacent to a first housing end **210***a*

of the housing **210** and a second hinge structure **290***b* adjacent to a second housing end **210***b* opposite to the first housing end **210***a*.

According to certain embodiments, at least a portion of the second supporting bracket **400** is movable using a bar-linkage mechanism. For example, the second supporting bracket **400** may be movable along the second direction D**2** using the plurality of second bars **420** connected with the hinge structure **290** and the third supporting member **410** and may adjust the distance between the third supporting member **410** and the housing **210**.

According to certain embodiments, the third supporting member **410** may include a ninth end **410***a* and a tenth end **410***b* opposite to the ninth end **410***a*. According to an embodiment, the third supporting member **410** may support the second end (e.g., the second end **243** of FIG. **10**) of the display **240**.

According to certain embodiments, the second bar **420** may include a plurality of second bars **422**, **424**, **426**, and **428** disposed between the third supporting member **410** and the hinge structure **290**. For example, the second bar **420** may include a 2-1th bar **422** rotatably connected to the ninth end **410***a*, a 2-2th bar **424** rotatably connected to the first hinge structure **290***a*, a 2-3th bar **426** rotatably connected to the tenth end **410***b*, and a 2-4th bar **428** rotatably connected to the second hinge structure **290***b*.

According to certain embodiments, the plurality of second bars **422**, **424**, **426**, and **428** may rotate based on the distance between the third supporting member **410** and the housing **210**. According to an embodiment, the 2-1th bar **422** may be rotatably connected to the 2-2th bar **424** with respect to the third point **420***c* positioned between the first housing end **210***a* and the ninth end **410***a*. According to an embodiment, the 2-3th bar **426** may be rotatably connected to the 2-4th bar **428** with respect to the fourth point **420***d* positioned between the second housing end **210***b* and the tenth end **410***b*. According to an embodiment, the third point **420***c* may be an end of the 2-1th bar **422** or the 2-2th bar **424**. For example, the third point **420***c* may be positioned opposite to the end of the 2-1th bar **422** connected with the ninth end **410***a* of the third supporting member **410**. According to an embodiment, the fourth point **420***d* may be an end of the 2-3th bar **426** or the 2-4th bar **428**. For example, the fourth point **420***d* may be positioned opposite to the end of the 2-3th bar **426** connected with the tenth end **410***b* of the third supporting member **410**. According to an embodiment, the 2-2th bar **424** may be rotatably connected to the first hinge structure **290***a* with respect to the fifth point **420***a*, and the 2-4th bar **428** may be rotatably connected to the second hinge structure **290***b* with respect to the sixth point **420***b*.

According to certain embodiments, the second supporting bracket **400** may include a guide member **430** connected with the plurality of second bars **420**. According to an embodiment, the guide member **430** may support at least a portion of the second display area (e.g., the second display area **244** of FIG. **13**). According to an embodiment, the guide member **430** may include a first guide member **432** connected with the 2-1th bar **422** and/or the 2-2th bar **424** at the third point **420***c* and a second guide member **434** connected with the 2-3th bar **426** and/or the 2-4th bar **428** at the fourth point **420***d*. According to an embodiment, the guide member **430** may receive at least a portion of the fourth supporting member **440**.

According to certain embodiments, the second supporting bracket **400** may include the fourth supporting member **440**, which in turn may be configured to slide within the guide member **430**. According to an embodiment, the fourth supporting member **440** may support at least a portion of the second display area (e.g., the second display area **244** of FIG. **13**). According to an embodiment, at least a portion of the fourth supporting member **440** may be inserted into the guide member **430**. According to an embodiment, as the distance between the third supporting member **410** and the housing **210** increases, a rate at which the fourth supporting member **440** is inserted into the guide member **430** may decrease. According to an embodiment, the fourth supporting member **440** may include connecting portions **440***a* and **440***b* connected with the plurality of third bars **450**. For example, the fourth supporting member **440** may include a first connecting portion **440***a* and a second connecting portion **440***b* extending toward the third supporting member **410**.

According to certain embodiments, the second supporting bracket **400** may include a third bar **450** supporting at least a portion of the second display area (e.g., the second display area **244** of FIG. **13**). The third bar **450** may include a plurality of third bars **452**, **454**, **456**, and **458** disposed between the third supporting member **410** and the fourth supporting member **440**. For example, the third bar **450** may include a 3-1th bar **452** including an end **450***a* rotatably connected to the third supporting member **410**, a 3-2th bar **454** rotatably connected to the fourth supporting member **440** in the first connecting portion **440***a*, a 3-3th bar **456** including an end **450***b* rotatably connected to the third supporting member **410**, and a 3-4th bar **458** rotatably connected to the fourth supporting member **440** in the second connecting portion **440***b*.

According to certain embodiments, the plurality of third bars **452**, **454**, **456**, and **458** may rotate based on the distance between the third supporting member **410** and the fourth supporting member **440**. According to an embodiment, the 3-1th bar **452** may be rotatably connected to the 3-2th bar **454** with respect to the seventh point **450***c* positioned between the first connecting portion **440***a* and the third supporting member **410**. According to an embodiment, the 3-3th bar **456** may be rotatably connected to the 3-4th bar **458** with respect to the eighth point **450***d* positioned between the second connecting portion **440***b* and the third supporting member **410**.

FIG. **16** is a perspective view illustrating a first display area exposed through a first cover part according to certain embodiments of the disclosure.

Referring to FIG. **16**, at least a portion of the display **240** may be visually exposed to an exterior of the device through the first cover part **220**. For example, the first cover part **220** may include a third surface **220***a* (e.g., a surface exposed to the outside) forming the exterior of the electronic device **200**. The first cover part **220** may be substantially transparent at the third surface **220***a*, and consequently, at least a portion of the display **240** may be visible from to the exterior of the electronic device **200** through the third surface **220***a*. The configuration of the housing **210**, the first cover part **220**, the second cover part **230**, and the display **240** of FIG. **16** may be identical in whole or part to the configuration of the housing **210**, the first cover part **220**, the second cover part **230**, and the display **240** of FIGS. **6** to **9**.

According to certain embodiments, in a state in which the display **240** is received in the housing **210**, a portion (e.g., the first end **241** of FIG. **6**) of the first display area **242** may output display information. For example, the display **240** (e.g., the first display area **242** and/or the second display area **244**) visually exposed through the first cover part **220** may output indicators representing, for example, a current charge level of the battery (e.g., the battery **189** of FIG. **1**), a

message notification, and/or a current time. According to an embodiment, the display **240** may output first information icon I**1** representing a present charge level relative to an overall capacity of the battery **189** and/or second information icon I**2** indicating the numerical ratio of charge to the total capacity of the battery **189**. According to an embodiment, the display **240** may output third information icon I**3** for representing received messages and, in some embodiments, a number string representing a count of the received messages. According to an embodiment, the display **240** may output fourth information icon I**4** reflecting the current time.

According to certain embodiments of the disclosure, an electronic device (e.g., the electronic device **200** of FIG. **2**) may include a housing (e.g., the housing **210** of FIG. **3**), a roller (e.g., the roller **250** of FIG. **6**) disposed in the housing, a first cover part (e.g., the first cover part **220** of FIG. **3**) configured to be detachable from the housing, a second cover part (e.g., the second cover part **230** of FIG. **3**) configured to be detachable from the housing, and a display (e.g., the display **240** of FIG. **3**) including a first display area (e.g., the first display area **242** of FIG. **3**) including a first end (e.g., the first end **241** of FIG. **6**) coupled with the first cover part and a second display area (e.g., the second display area **244** of FIG. **6**) including a second end (e.g., the second end **243** of FIG. **6**) coupled with the second cover part. At least a portion of the first display area may be configured to be wound around the roller while facing at least a portion of the second display area.

According to certain embodiments, the electronic device may further include an elastic member including a third end (e.g., the third end **282** of FIG. **8**) connected with the display and a fourth end (e.g., the fourth end **284** of FIG. **8**) connected with the roller.

According to certain embodiments, the electronic device may further include a first supporting bracket (e.g., the first supporting bracket **260** of FIG. **7**) connected with the first cover part and the housing and configured to support the first display area.

According to certain embodiments, the first supporting bracket may include a first supporting member (e.g., the first supporting member **310** of FIG. **14**C) connected with the housing and including a fifth end (e.g., the fifth end **310***a* of FIG. **14**C) and a sixth end (e.g., the sixth end **310***b* of FIG. **14**C) opposite to the fifth end, a second supporting member (e.g., the second supporting member **320** of FIG. **14**C) connected with the first cover part and including a seventh end (e.g., the seventh end **320***a* of FIG. **14**C) and an eighth end (e.g., the eighth end **320***b* of FIG. **14**C) opposite to the seventh end, and a plurality of first bars (e.g., the first bars **266** of FIG. **13**) disposed between the first supporting member and the second supporting member. The plurality of first bars may include a 1-1th bar (e.g., the 1-1th bar **332** of FIG. **14**C) rotatably connected to the fifth end, a 1-2th bar (e.g., the 1-2th bar **334** of FIG. **14**C) rotatably connected to the seventh end, a 1-3th bar (e.g., the 1-3th bar **336** of FIG. **14**C) rotatably connected to the sixth end, and a 1-4th bar (e.g., the 1-4th bar **338** of FIG. **14**C) rotatably connected to the eighth end. The 1-1th bar may be rotatably connected to the 1-2th bar with respect to a first point (e.g., the first point **330***a* of FIG. **14**C) positioned between the fifth end and the seventh end, and the 1-3th bar may be rotatably connected to the 1-4th bar with respect to a second point (e.g., the second point **330***b* of FIG. **14**C) positioned between the sixth end and the eighth end.

According to certain embodiments, the electronic device may further include a second supporting bracket (e.g., the second supporting bracket **270** of FIG. **13**) connected with the second cover part and the housing and configured to support the second display area.

According to certain embodiments, the electronic device may further include a hinge structure (e.g., the hinge structure **290** of FIG. **8**) rotatably connecting the second supporting bracket to the housing.

According to certain embodiments, the hinge structure may include a fixing part (e.g., the fixing part **292** of FIG. **6**) disposed on a first surface of the housing configured to face the second cover part and a rotation bracket coupled with the second supporting bracket and configured to rotate about the fixing part.

According to certain embodiments, the second supporting bracket may include a third supporting member (e.g., the third supporting member **410** of FIG. **15**C) connected with the second cover part and including a ninth end (e.g., the ninth end **410***a* of FIG. **15**C) and a tenth end (e.g., the tenth end **410***b* of FIG. **15**C) opposite to the ninth end, and a plurality of second bars (e.g., the second bars **420** of FIG. **15**C) connected with the hinge structure and the third supporting member.

The hinge structure may include a first hinge structure (e.g., the first hinge structure **290***a* of FIG. **15**C) connected with a first housing end (e.g., the first housing end **210***a* of FIG. **15**C) of the housing and a second hinge structure (e.g., the second hinge structure **290***b* of FIG. **15**C) connected with a second housing end (e.g., the second housing end **210***b* of FIG. **15**C) opposite to the first housing end. The plurality of second bars may include a 2-1th bar (e.g., the 2-1th bar **422** of FIG. **15**C) rotatably connected to the ninth end, a 2-2th bar (e.g., the 2-2th bar **424** of FIG. **15**C) rotatably connected to the first hinge structure, a 2-3th bar (e.g., the 2-3th bar **426** of FIG. **15**C) rotatably connected to the tenth end, and a 2-4th bar (e.g., the 2-4th bar **428** of FIG. **15**D) rotatably connected to the second hinge structure. The 2-1th bar may be rotatably connected to the 2-2th bar with respect to a third point (e.g., the third point **420***c* of FIG. **15**C) positioned between the first housing end and the ninth end, and the 2-3th bar may be rotatably connected to the 2-4th bar with respect to a fourth end (e.g., the fourth end **420***d* of FIG. **15**C) positioned between the second housing end and the tenth end. According to certain embodiments, the second supporting bracket may include a guide member (e.g., the guide member **430** of FIG. **15**C) connected with the plurality of second bars at the third point and the fourth point, a fourth supporting member (e.g., the fourth supporting member **440** of FIG. **15**B) configured to slide within the guide member and a plurality of third bars (e.g., the third bars **450** of FIG. **15**C) disposed between the third supporting member and the fourth supporting member.

According to certain embodiments, at least a portion of the first display area may be visually exposed through the first cover part.

According to certain embodiments, the electronic device may further include a spring structure (e.g., the spring structure **254** of FIG. **10**) to provide an elastic force to the roller in a direction in which the display is inserted into the housing, and a damping member (e.g., the damping member **256** of FIG. **10**) connected with the roller to provide a braking force for reducing the elastic force of the spring structure.

According to certain embodiments, the roller may include a plurality of end areas (e.g., the end areas **250***b* of FIG. **5**) including a plurality of protrusions (e.g., the protrusions **252** of FIG. **6**) and a central area (e.g., the central area **250***a* of FIG. **5**) positioned between the plurality of end areas and

facing the display. The electronic device may further include a stopper structure (e.g., the stopper structure **258** of FIG. **10**) configured to contact the plurality of protrusions.

According to certain embodiments, the electronic device may further include an input structure (e.g., the input structure **214** of FIG. **10**) at least partially exposed to an outside of the housing and connected with the stopper structure. The input structure may be configured to change a position of the stopper structure with respect to the plurality of protrusions based on a user input.

According to certain embodiments, the first cover part may be configured to be detachable from the housing in a first direction (e.g., the first direction D**1** of FIG. **7**), and the second cover part may be configured to be detachable from the housing in a second direction (e.g., the second direction D**2** of FIG. **7**) different from the first direction.

According to certain embodiments, the display may include a third display area (e.g., the third display area **246** of FIG. **7**) positioned between the first display area and the second display area. The roller may include a receiving groove (e.g., the receiving groove **253** of FIG. **11**) for receiving the third display area.

According to certain embodiments of the disclosure, an electronic device (e.g., the electronic device **200** of FIG. **2**) may include a housing (e.g., the housing **210** of FIG. **2**), a roller (e.g., the roller **250** of FIG. **6**) disposed in the housing, a first cover part (e.g., the first cover part **220** of FIG. **7**) configured to be detachable from the housing in a first direction (e.g., the first direction D**1** of FIG. **7**), a second cover part (e.g., the second cover part **230** of FIG. **7**) configured to be detachable from the housing in a second direction different from the first direction, and a display (e.g., the display **240** of FIG. **7**) including a first display area (e.g., the first display area **242** of FIG. **6**) including a first end (e.g., the first end **241** of FIG. **6**) coupled with the first cover part and a second display area (e.g., the second display area **244** of FIG. **6**) including a second end (e.g., the second end **243** of FIG. **6**) coupled with the second cover part and configured to be wound around the roller.

According to certain embodiments, a first front surface (e.g., the first front surface **242***a* of FIG. **3**) of the first display area and a second front surface (e.g., the second front surface **244***a* of FIG. **3**) of the second display area may be configured to be wound around the roller while facing each other.

According to certain embodiments, the electronic device may further include an elastic member (e.g., the elastic member **280** of FIG. **8**) including a third end (e.g., the third end **282** of FIG. **8**) connected with the display and a fourth end (e.g., the fourth end **284** of FIG. **8**) connected with the roller.

According to certain embodiments, the electronic device may further include a first supporting bracket (e.g., the first supporting bracket **260** of FIG. **7**) connected with the first cover part and the housing and configured to support the first display area.

According to certain embodiments, the electronic device may further include a second supporting bracket (e.g., the second supporting bracket **270** of FIG. **7**) connected with the second cover part and the housing and configured to support the second display area.

It is apparent to one of ordinary skill in the art that an electronic device including various rollers according to the disclosure are not limited to the above-described embodiments and those shown in the drawings, and various changes, modifications, or alterations may be made thereto without departing from the present disclosure.

The invention claimed is:

1. An electronic device, comprising:
- a housing;
- a roller disposed in the housing;
- a first cover part that is detachable from the housing;
- a second cover part that is detachable from the housing; and
- a display including a first display area and a second display area,
  - the first display area including a first end coupled with the first cover part, and
  - the second display area including a second end coupled with the second cover part,
- wherein the display is configured to be wound around the roller while being folded at a position between the first display area and the second display area such that at least a portion of the first display area face at least a portion of the second display area in the housing.

2. The electronic device of claim **1**, further comprising an elastic member including a third end connected with the display, and a fourth end connected with the roller.

3. The electronic device of claim **1**, further comprising a first supporting bracket connected with the first cover part and the housing, the first supporting bracket configured to support the first display area.

4. The electronic device of claim **3**, wherein the first supporting bracket includes:
- a first support member connected with the housing and including a fifth end and a sixth end opposite to the fifth end,
- a second support member connected with the first cover part, and including a seventh end and an eighth end opposite to the seventh end, and
- a plurality of first bars disposed between the first support member and the second support member, wherein the plurality of first bars includes:
- a 1-1th bar rotatably connected to the fifth end, a 1-2th bar rotatably connected to the seventh end, a 1-3th bar rotatably connected to the sixth end, and a 1-4th bar rotatably connected to the eighth end, and
- wherein the 1-1th bar is rotatably connected to the 1-2th bar with respect to a first point between the fifth end and the seventh end, and the 1-3th bar is rotatably connected to the 1-4th bar with respect to a second point between the sixth end and the eighth end.

5. The electronic device of claim **1**, further comprising a second supporting bracket connected with the second cover part and the housing, the second support bracket configured to support the second display area.

6. The electronic device of claim **5**, further comprising a hinge structure rotatably connecting the second supporting bracket to the housing.

7. The electronic device of claim **6**, wherein the hinge structure includes,
- a fixing part disposed on a first surface of the housing configured to face the second cover part and
- a rotation bracket coupled with the second supporting bracket, and configured to rotate about the fixing part.

8. The electronic device of claim **6**, wherein the second supporting bracket includes:
- a third support member connected with the second cover part, and including a ninth end and a tenth end opposite to the ninth end, and
- a plurality of second bars connected with the hinge structure and the third support member,
- wherein the hinge structure includes a first hinge structure connected with a first housing end of the housing, and

a second hinge structure connected with a second housing end opposite to the first housing end,

wherein the plurality of second bars include:

a 2-1th bar rotatably connected to the ninth end, a 2-2th bar rotatably connected to the first hinge structure, a 2-3th bar rotatably connected to the tenth end, and a 2-4th bar rotatably connected to the second hinge structure, and

wherein the 2-1th bar is rotatably connected to the 2-2th bar with respect to a third point between the first housing end and the ninth end, and the 2-3th bar is rotatably connected to the 2-4th bar with respect to a fourth point between the second housing end and the tenth end.

9. The electronic device of claim **8**, wherein the second supporting bracket includes:

a guide member connected with the plurality of second bars at the third point and the fourth point,

a fourth support member configured to slide within the guide member and

a plurality of third bars disposed between the third support member and the fourth support member.

10. The electronic device of claim **1**, wherein at least a portion of the first display area is exposed as to be visible through the first cover part.

11. The electronic device of claim **1**, further comprising:

a spring structure providing an elastic force to the roller in a direction in which the display is inserted into the housing; and

a damping member connected with the roller to provide a braking force for reducing the elastic force provided by the spring structure.

12. The electronic device of claim **1**, wherein the roller includes a plurality of end areas including a plurality of protrusions, and a central area positioned between the plurality of end areas, the central area oriented as to face the display, and

wherein the electronic device further includes a stopper structure configured to contact the plurality of protrusions.

13. The electronic device of claim **12**, further comprising an input structure at least partially exposed to an exterior of the housing, and connected with the stopper structure,

wherein the input structure is configured to change a position of the stopper structure with respect to the plurality of protrusions based on a user input.

14. The electronic device of claim **1**, wherein the first cover part is detachable from the housing in a first direction, and

wherein the second cover part is detachable from the housing in a second direction different from the first direction.

15. The electronic device of claim **1**, wherein the display includes a third display area between the first display area and the second display area, and

wherein the roller includes a receiving groove for receiving the third display area of the display.

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